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# PROJECTIONIST

INTERNATIONAL



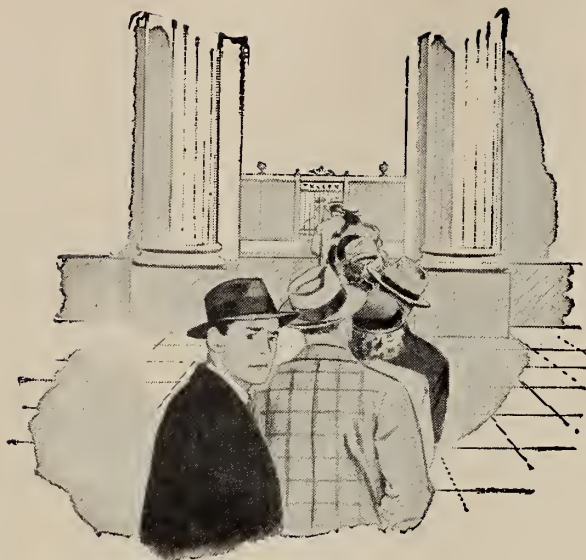
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# INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING



HENRY B. SELLWOOD, *Editor*

Volume 24

JANUARY 1949

Number 1

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## MONTHLY CHAT

WHILE there were few outward signs of any sharp advances technologically within projection circles during 1948, it would be less than wise to mark that period off as a wholly static year. Plans formulated and research, development and testing effort expended during 1948 will blossom into actuality during the coming year and, possibly, through several years thereafter.

No branch of the motion picture industry—from managers and projectionists in theatres on up through the studio artistic and technical forces to the higher echelon of management (and not forgetting those hard-headed fellows from Wall Street and its counterparts who supply the wherewithal) nobody is unaware of the tremendous task that confronts the industry in its life-or-death struggle to combat the many forms of entertainment which now compete with the film box-office dollar. Rampant though it be at the moment, television is by no means the only threat to the theatre box-office; Tv merely intensifies the competition.

If the film industry is to continue as a healthy economic organism, it appears certain that the life-sustaining energy must flow from its technicians. Films must be made very much more appealing to the increasingly discerning eye of the amusement-seeker, not only in terms of story content and artistic execution but also by means of vastly improved technique in production and presentation.

Three-dimensional pictures, stereophonic sound and greatly improved color processes are but three of the advances long promised by the film industry; but it begins to look as though the Big Brass executives have become very coy about putting money into technological developments on behalf of an industry which, while the source of their opulence and personal power, might possibly be in for a bit of rough going. Difficult of accomplishment though the aforementioned developments might be, complete candor compels the observation that they would be duck soup for that gang of technicians who have brought Tv to its comparatively high estate.

There is more than a suspicion that the Big Brass is flirting with the notion of going over into the Tv camp en masse (strictly as a production enterprise in studios already available) and let the exhibition field make its own way. This suspicion is strengthened by the strange apathy displayed by film executives in moving to avail themselves of even a single Tv channel for theatre use.

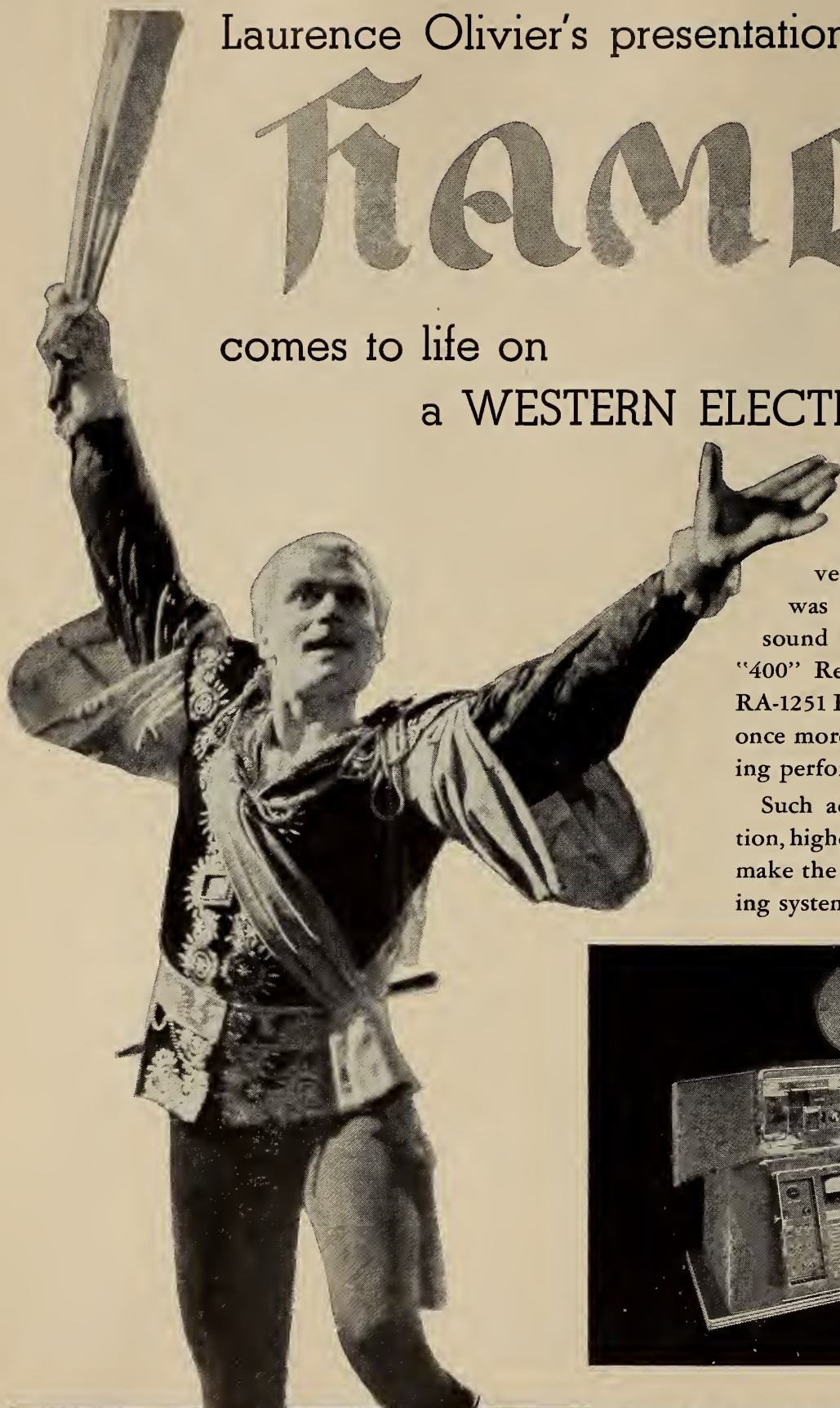
So, whatever the desires and capabilities of its technical forces, the immediate and long-range welfare of the motion picture industry will be decided largely by the decisions made in executive eeries in New York. We shall know the answer before 1949 is very far advanced.

Laurence Olivier's presentation of

# HAMLET

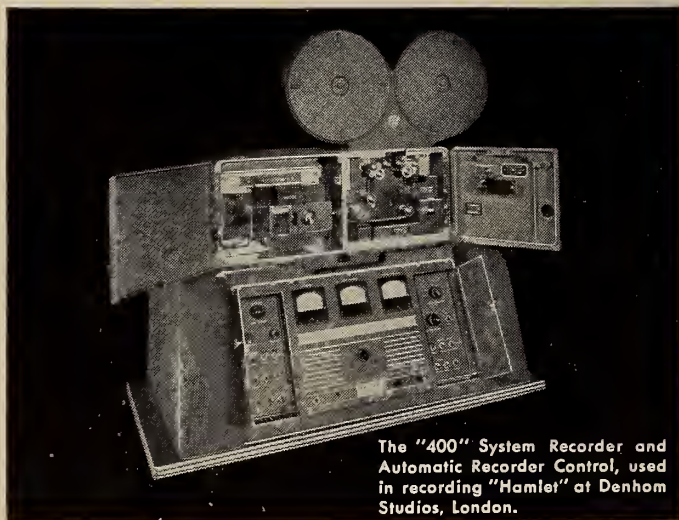
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## HAMLET

Produced and Directed by . . . Laurence Olivier  
Recorded at . . . . . Denham Studios  
Sound Supervisor . . . . . Cyril Crowhurst  
Sound by . . . . . Western Electric



# Sound System Components

ONE of the most conspicuous features of an electric current is the phenomenon of *polarity*, the distinction between positive and negative potentiality. This characteristic of electricity may be ascribed to the fact that the flow of current in a circuit is unidirectional at any specified instant. As an illustration, consider the terminals of a dry cell: when a circuit is established by connecting the two terminals, current leaves one terminal and enters the other.

It is absurd to think of electricity as consisting of two separate kinds, positive and negative, which seek to join or "amalgamate," as one writer of projection texts quaintly expresses it. Electricity is a single entity. Polarity is merely the result of direction of flow.

Until the latter part of the last century electrical engineers had no way of knowing which way electricity moves. The early supposition that current flows from positive to negative was incorrect; *we now know that the reverse is true*. The older incorrect theory nevertheless still survives in our custom of tracing d-c circuits from positive to negative, and also in the practice of grounding the negative side of amplifier circuits.

A study of the action of electron tubes and photoelectric cells proves conclusively that electric current flows from negative to positive. For the present, however, let us ignore these purely scientific considerations and delve into the eminently practical problem of determining which of two wires conducting d-c is positive and which is negative.

Many electrical appliances—inca-

By ROBERT A. MITCHELL

## III. Alternating Currents

buzzers, *etc.*—do not require specified polarity connections. Their operation is not affected in the slightest degree when their leads are reversed. But certain other d-c-operated devices—arc lamps, photocells, amplifier tubes, *etc.*—must be properly connected with respect to polarity if they are to operate.

### Tests for Polarity

There are several good tests for polarity at the disposal of projectionists. A d-c voltmeter, the terminals of which are correctly marked + and —, provides the simplest and most rapid test. When correctly "poled" (positive wire to + terminal; negative wire to — terminal) the voltage will be indicated by the meter. If, however, the wires be reversed, no reading will be obtained. (In such a case the pointer will be impelled to swing over to the off-scale side of zero.)

Another test requires the acquisition of a fresh raw potato. The white part of a thick slice of the potato is touched by the two copper wires charged with d-c. For best results the two wires should be thrust into the slice about half an inch apart. In a minute or more, depending on the voltage, the potato will be stained green around the positive wire.

In the aforementioned test the slice of potato serves as a crude sort of "test strip," but those who wish may easily prepare professional polarity test paper. This is accomplished by soaking white blotting paper in a solution of salt water

to which a small quantity of phenolphthalein in alcohol has been added.<sup>1</sup> The paper is allowed to dry and is stored for future use. To test polarity, a strip of the test paper is moistened with water and touched by the two wires carrying d-c. A bright red stain will develop on the paper surrounding the negative wire.

A fourth test for polarity involves the electrolysis of water. Introduce the two uninsulated wires into a glass of water containing a pinch of salt. The wires should be held about an inch apart. In a short time—depending on the strength of the current—bubbles of hydrogen gas will collect around the negative wire and tend to cling to it.

### Alternating Currents; Frequency

If the circuit connections to the terminals of a dry cell or other source of d-c be continually reversed, the e.m.f (electromotive force, or voltage) will be periodically reversed in polarity. Instead of a continuous d-c, a reversing and pulsating, or *alternating*, current will flow through the circuit.

The laws which govern the flow of a-c are much more complicated than those which obtain with continuous d-c, but so important is a-c in sound amplification that its study, though difficult, is well worth our time and effort.

The rate of periodic reversal of a-c is called the *frequency* of the current. It is usually measured in cycles per second. For 60-cycle a-c, the current flows in one direction for 1/120 of a

<sup>1</sup> Dissolve 15 grains of colorless phenolphthalein in a small quantity of alcohol. Add the alcoholic solution of phenolphthalein to 4 fluid ounces of water in which 75 grains of salt (sodium chloride) have been dissolved.

second; during the next 1/120 second it flows in the other direction. The complete cycle therefore takes 2/120, or 1/60, second; hence we say that the frequency of the current is 60 cycles per second.

Because the direction of current-flow does not affect the operation of incandescent lamps, a lamp burning on 60-cycle current brightens and dims 120 times every second. It follows from this that soundhead exciting lamps powered by 60-cycle current produce a 120-cycle hum in the sound, but this is so faint that it is not heard during the presentation of the picture.

The alternating audio (sound) currents fed into the voice coils of theatre speakers have frequencies ranging from 30 to 9,000 c.p.s. This range includes the principal frequencies of sound which can be appreciated by the human ear.

### The Generation of A-C

A-C intended for power purposes is produced by electromagnetic induction in a-c generators, but in special cases a-c is made by rapidly interrupting the flow of d-c, the periodic reversal of polarity being produced by the "reactance" of inductive coils or condensers.

The simplest way to generate a-c is to move a bar magnet rapidly in and out of a coil of wire. As the magnet moves in, the magnetic field "cuts" the coil and drags electrons along, thus producing a single pulsation of electric current in one direction; but when the magnet is withdrawn, another pulsation is produced, but it flows in the opposite direction. The two pulsations constitute one cycle of a-c. Additional pulsations merely repeat the first two.

Such a method of making a-c is clearly impractical. We may improve on the simple apparatus by rotating the coil of wire between the poles of a powerful horseshoe magnet, and to increase the magnetic effectiveness of the coil we provide it with a laminated core of soft iron. The problem of taking the current from the whirling coil is solved by the use of collector rings and brushes.<sup>2</sup>

One complete revolution of the coil of our simple bipolar alternator results in one complete cycle of a-c. During this cycle the current gradually rises from zero, builds up to a maximum value, and falls to zero again; whereupon the process repeats, but with reversed polarity. The wire which is positively charged during the first pulsation, or half-cycle, will be negatively charged during the second half-cycle.

### The Sine Wave

The fluctuations of current (or voltage) and polarity may be shown graph-

ically. If there are no magnetic disturbances or irregularities in the action of the generator, the current will follow a smooth curve, as in Figs. 1 and 2. This type of curve, the simplest possible, is called a *sine wave*.

Figure 1 shows what is meant by the term "sine" as applied to this wave. A sine is one of the trigonometric functions, with the sines of angles varying from 0 to 1, positive or negative. Fig. 1 was drawn by plotting angles against their sines. Since one cycle of a-c corresponds to a complete angular revolution of 360 degrees, one set of ordinates (lines on the graph) was assigned angular values up to 360 degrees; while the other set of ordinates was given the values of the sines on both sides of 0 (0 to +1, and 0 to -1).

Now the sines of 0°, 30°, 60°, etc., may be tabulated as follows:

$\sin 0^\circ = 0$	$\sin 180^\circ = 0$
$\sin 30^\circ = 0.5$	$\sin 210^\circ = -0.5$
$\sin 60^\circ = 0.866$	$\sin 240^\circ = -0.866$
$\sin 90^\circ = 1.0$	$\sin 270^\circ = -1.0$
$\sin 120^\circ = 0.866$	$\sin 300^\circ = -0.866$
$\sin 150^\circ = 0.5$	$\sin 330^\circ = -0.5$
$\sin 360^\circ = 0$	

When these data are accurately plotted on the coordinates of the graph, and the points connected by a smooth curve, the sine wave seen in Fig. 1 results.

### Peak and Effective Values

Since in a-c both voltage and current swing continuously between their positive and negative maximum (peak) values, it may be wondered how we can

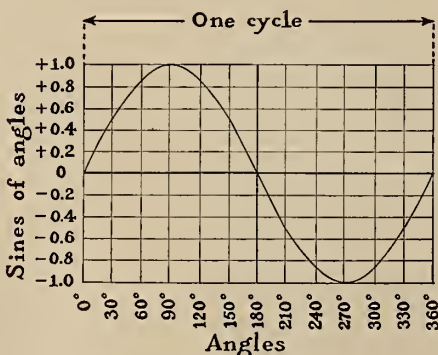


FIG. 1. A sine wave.

speak of "so many volts," or "so many amperes" of a-c. The difficulty is cleared up by using *effective values* of e.m.f. and current which have the same effect in producing heat in resistances as corresponding d-c values.

A-c voltmeters and ammeters indicate effective volts and effective amperes.

When the simple sine wave is considered, a direct relation is discernible between the instantaneous *peak values* of volts (or amperes) and the effective values. The minimum and maximum values of e.m.f. (or current) are sepa-

rated by an angular difference of 90 degrees, as shown by Fig. 1. The mean of 0 degrees and 90 degrees is 45 degrees, and  $\sin 45^\circ$  is 0.707. So if the instantaneous peak value of voltage or current be represented by 1 ( $\sin 90^\circ$ ), the effective value<sup>3</sup> will be represented by 0.707 ( $\sin 45^\circ$ ). Hence:

$$\begin{aligned} \text{Effective value} &= 0.707 \times \text{Peak value} \\ \text{Peak value} &= 1.414 \times \text{Effective value} \end{aligned}$$

These formulas may be used for solving certain types of problems. As an example, suppose an A.C. generator develops + and - peaks of 12 volts. What is the effective voltage?

$$E_{\text{eff.}} = 0.707 \times 12 = 8.484 \text{ volts}$$

As another illustration consider a capacitor connected across a 110-volt, 60-cycle line. Assuming that the a-c fluctuations follow a sine wave, what peak voltage must this capacitor withstand?

$$E_{\text{max.}} = 1.414 \times 110 = 155.54 \text{ volts}$$

### A. C. Characteristics

The simple relationship between e.m.f., current, and resistance in a d-c circuit is expressed by Ohm's law. It is only when the flow of current is started or stopped in a d-c circuit containing inductive or capacitive devices that we observe occurrences that utterly defy Ohm's law.

Now, these "anomalous" occurrences become very prominent in an a-c circuit because a-c is a current which starts and stops many times each second. We are accordingly forced to supplement our knowledge of Ohm's law by an acquaintance with *inductance* and *capacitance* if we are to deal intelligently with alternating currents.

### Electromagnetic Induction

The principle of electromagnetic induction is easy to understand. When a current passes through a conductor, a magnetic field is established around that conductor. (This is the result of electrons in motion.) Further, when a magnetic field "cuts" through a conductor, an electromotive force is generated in that conductor.

But remember: no e.m.f. is generated if the conductor is merely *in* the magnetic field. In order for an electric potential to be set up, the conductor must be *moving through* the magnetic field (or the magnetic field must be moving through the conductor, which is the same thing).

Summed up, we may say that a moving electric field produces a magnetic field, and that a moving magnetic field produces an electric field.

A magnetic field which varies in strength is considered to be in motion (expanding and collapsing), even

<sup>2</sup> The necessity of drawing heavy currents through slip-rings and brushes is eliminated in commercial alternators of large size by rotating the magnetic field inside a stationary ring of coils. The armature therefore becomes the "stator," and the field the "rotor."

<sup>3</sup> The author holds that this trigonometric derivation of the effective values is considerably simpler than the "root-mean-square" derivation preferred by most electrical writers.

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carbons change dim screen**



**SQUINT**



**to bright screen**

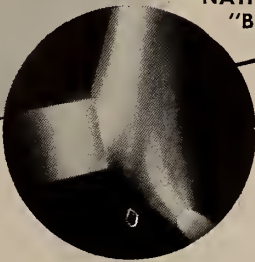


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though the source of magnetic flux remains fixed in one place.

The electromagnetic induction of electric current is the underlying principle of generators and transformers: the former utilizing mechanically-rotated magnets of constant strength, and the latter fixed magnets of fluctuating strength. It is obvious that the net result is the same in both cases: currents are induced by magnetic fields cutting through conductors.

Because the magnetic fields produced by a steady d-c are non-varying in intensity, no electromagnetic induction occurs in a d-c circuit unless means are provided for rapidly varying the strength of the current. When a-c is considered, however, we encounter pronounced self-induction, or inductance, effects.

### Effects of Inductance

Assume that a choke is connected to a suitable source of d-c. (A choke is a coil of wire wound around a core of soft iron.) The coil impedes the flow of d-c by virtue of its resistance—the resistance of the wire. The value of the resistance is easily calculated by Ohm's law when we know the voltage-drop and the current passed:

$$R = \frac{E}{I}$$

and the power formula gives the number of watts dissipated in the resistance as heat:

$$P = EI$$

When the same choke is connected to a source of a-c neither the Ohm's law formula nor the power formula hold good. The mathematical product of voltmeter and ammeter readings will not be the true power consumed by the choke.

Indeed, the *true watts* (measured by a wattmeter) will be vastly less than the *apparent watts* obtained by multiplying volts by amperes.

This strange state of affairs is due to the induction of an *opposing* e.m.f. in the choke. Why opposing? An important principle known as Lenz's law tells us that an induced current always flows in such a direction that it opposes (counteracts) the magnetic field of the original current. The net result of the two currents (the applied and the induced) flowing in the same circuit is a time-displacement between volts and amperes.

In other words, the volt-peaks and the ampere-peaks no longer coincide. All inductive devices (chokes, electromagnets, transformers, motors, etc.) cause the current changes to lag behind the voltage changes. Curve B in Fig. 2 shows a 90-degree current lag.

An inductance shifts the phase in this manner because the induction of current is greatest when the applied current is changing most rapidly, that is, when it passes through the zero point. We thus find that the induced voltage flows in a direction opposite to the supplied current during the intervals of falling current: hence the current changes are said to lag behind the voltage changes by 90 degrees in a purely inductive circuit.

Since in practice there is always some resistance in a circuit, the current lag due to inductance may approach, but never reach, a full 90 degrees.

### Wattless Current

Current having an "angle of phase difference" approaching 90 degrees (current lagging or leading by nearly 90 degrees) is called "wattless" current. Such a current is obtained when we feed a-c

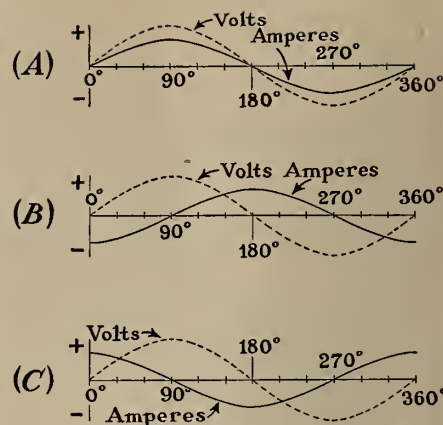


FIG. 2. Alternating current curves: (A) e.m.f. and current in phase; (B) current lagging by 90 degrees; (C) current leading by 90 degrees.

to the primary of a transformer whose secondary circuit is open.

Voltmeter and ammeter readings taken on the "live" primary circuit will indicate a heavy consumption of electric power, but the watts found by multiplying volts by amperes are largely apparent watts. (The word *apparent* as applied to watts means "seeming.") The out-of-phase components of the wattless current merely surge in and out of the transformer without the expenditure of power.

It is for this reason that the primary of a doorbell transformer may be permanently connected to the 110-volt a-c line. Except when the volt and ampere components are brought into phase by taking power from the secondary, as by ringing a doorbell, the power consumption of the transformer is negligible. Because inductance does not figure in a d-c circuit, the transformer would quickly burn up if connected to a source of 110 volts of d-c!

### Power Factor

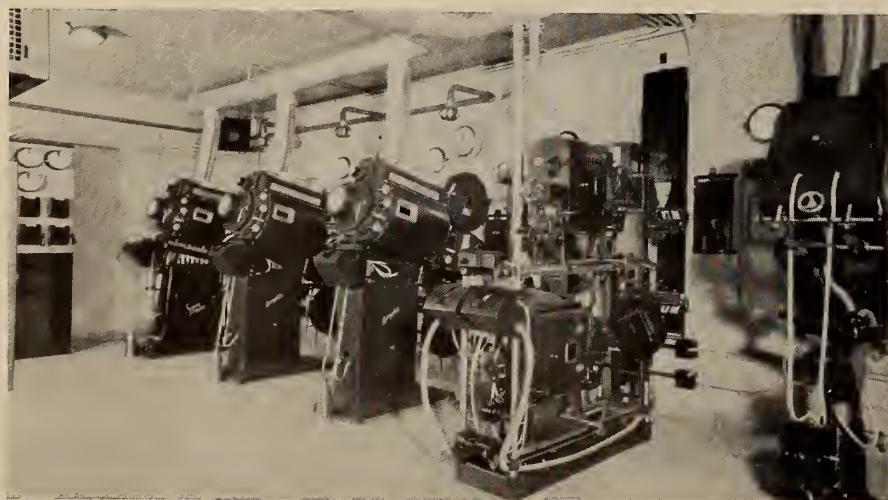
In order to calculate the power dissipated in an a-c circuit (true watts), we must multiply the product of volts times amperes by a factor called the *power factor* of the circuit. The power factor is the cosine of the angle of phase difference between current and e.m.f., which angle is represented by the Greek letter phi,  $\phi$ .

$$P_{\text{true}} = EI \cos \phi$$

The cosine of 90° of current lag or lead is 0, hence in wattless current the value of the true watts is obviously 0. When current and e.m.f. are in phase (that is, when volt- and ampere-peaks coincide), the phase angle is 0°; and since  $\cos 0^\circ$  is 1, the value of the true watts is the full product of volts multiplied by amperes, just as with d-c.

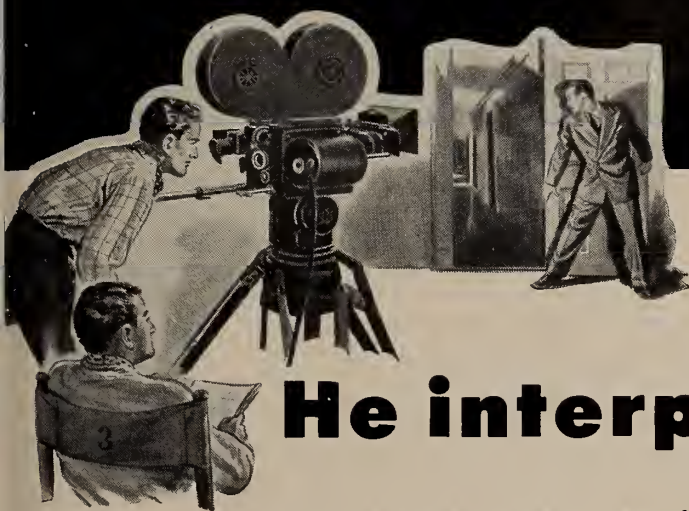
The quotient obtained by dividing true watts (determined with a wattmeter) by the product of volts times amperes (sep-

(Continued on page 29)



CINEMA NORMANDIE, PARIS

One of the best European installations, this room is 30 by 15 feet and utilizes a 140-foot throw. Equipment includes a Western Electric M-2 sound system (3 machines); Simplex projectors, Peerless lamps, Hertner Transverter, and a Brenkert effect projector. Installation by Westrex.



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# The Concave Screen

**D**ECENT interment rites having been observed several years ago, it occasions no little surprise that some segments of the projection field have again interested themselves in the possibility of correcting certain deficiencies in the projection process by utilizing a curved screen. So alarming is this renewed interest in a technological corpse, that we hasten to deliver another—and, we hope, final—graveside sermon over that which, it was thought, had long since departed this world.

The curved screen was sired by a combination of muddled technical thinking, smart promotional minds, and theatre owners who don't know the difference between a photocell and a projection lens.

The curved screen was touted as capable of accomplishing the following chores: (1) correction of distortion; (2) elimination of "hot spot" and glare; (3) creation of an "illusion" of depth; (4) improvement of sound transmission; (5) elimination of the keystone effect, and (6) the screen "could be washed like glass".

The most recent curved screen is composed of two surfaces of Fiberglas (made by Corning Glass Works): the first sheet is loosely woven, while the second surface, two inches behind the first, is very tightly woven. Both sheets are laced to the frame.

The passage of light through these dissimilarly-woven surfaces of Fiberglas is asserted to enhance the illusion of depth and eliminate screen lines and glare by diffusing and polarizing the light. Let's see about this and other assertions made in behalf of such a screen.

## 1. Screen Image Distortion

Far from eliminating distortion, the curved screen *creates* it! To patrons sitting at the extreme right and left front seats such a screen does appear to lessen distortion—but this is only because parts of the screen are *hidden from view* by the curvature. In all other seats throughout the theatre the screen creates distortion.

Because the screen is curved, not flat, horizontal straight lines appear bowed, while vertical straight lines are variously curved, depending upon the camera angle and the seat from which the screen is viewed.

Titles shown on such a screen come up curved instead of in a straight line. In the case of vertical straight lines—for example, a microphone stand in a scene where the camera is "panned"—the stand bends like a bow, alternately bending and bowing. Projection images on a curved screen distorts the focus, because

one cannot focus on a single plane.

The distortion occasioned by the location of seats too far over at either side of the theatre is not, optically speaking, true distortion but merely the familiar law of perspective. Such screens as have been devised in an attempt to compensate for this deficiency, while they may add to the illusion of naturalness, can never circumvent the laws of perspective.

The important thing to remember is that this type of "distortion" is not true distortion but the natural perspective seen when viewing anything obliquely.

## 2. 'Hot Spot' and Glare

In front projection the correction of a "hot spot" (so-called because of a concentration of light within a spot at the center of the screen and a deficiency of light elsewhere within the screen area) is definitely not a function of any screen, but rather is it solely a question of the optics of the projector.

As to glare, a curved screen produces more, not less, glare.

## 3. Illusion of Depth

No data advanced by the proponents of curved screens—nor, for that matter, nothing in the literature of the art prior or present—lends any credence to the assertion that a curved screen contributes in even the slightest degree to an enhanced illusion of depth.

## 4. Sound Transmission

The assertion that this Fiberglas screen improves sound transmission is just not true, and, in fact, this is not a function of *any* type screen. All screens impair sound transmission to a certain measurable extent, and the Fiberglas curved screen is neither better nor worse in this respect.

## 5. The Keystone Effect

Elongation of the projected image is caused by steep projection angles. The same is true of keystoneing, which is the widening of the image at the bottom of the screen, with its characteristic convergence of vertical lines toward the top.

These deficiencies could be corrected

# Projected Light and the Curved Screen

## A Lens Manufacturer Assays the Concave Screen

**A** GOOD projection lens is designed to form an image on a plane surface. The light rays contributing to the formation of *each point* on such image (italics ours—ED.) emerge from the aperture of the projection lens, 2 inches or so in diameter, and 100 feet or more away. The cone of light thus formed has a very small included angle and, in consequence, a displacement of the screen a few inches from its theoretical plane surface would have little or no visible effect upon the image quality.

A sufficiently concave screen would have some effect upon the distortion of the screen image when viewed from a position to the extreme right or left of the theatre. Figures on the far side of the screen from the observer would appear somewhat less distorted, since the viewing angle would be less acute; those on the near side would appear *more distorted* (italics ours); and those in the center would remain unchanged. Whether these results would be of advantage to the audience we cannot say.

Very much open to question in our mind, however, is the statement that a screen composed of two layers would add anything to the illusion of depth in the projected image, or that this arrangement would polarize the image or eliminate glare; but we are willing to be shown.

This matter of curved screen surfaces would need, and seems worthy of, much more thorough investigation and some tangible information if one is to properly evaluate its worth or lack of it. Thus far the proponents of such screens have offered nothing that would provide the basis for such scientific appraisal.

It appears that the manufacturers of such screens consider each installation as an individual problem and that each screen must be specially designed on the basis of width of theatre, screen size and length of throw. An analysis of a typical situation of this sort and of the method whereby the curvature of the screen is computed would be of considerable interest and a most worthy contribution to the literature of the art.

somewhat by tilting a flat screen to a suitable, but impractical, angle, but the effect anywhere but in the center of the theatre is usually so grotesque as to render futile any such course of action. A curved screen cannot eliminate key-stoning except at certain places where the curvature assumes the same impractical angle.

## 6. 'Can Be Washed Like Glass'

This is a false and wholly misleading statement. With ordinary glass, dirt which gathers on the surface may be rubbed off. The curved screen under discussion consists of a grouping of glass threads between the fibers of which dirt collects. As with any fabric, the dirt must be washed out by laundering.

Because this Fibreglas screen depends

for sound transmission upon small pores in its weave—as contrasted with the large perforations in conventional screens—it is definitely a dust trap. In this respect it is similar to the earliest sound screens, which were woven and not perforated and which soiled with amazing speed.

The Fibreglas screen necessarily would have to be taken down frequently and laundered; and if the show is to continue uninterruptedly, the theatre would have to have a replacement screen available or pay overnight laundering charges. This is a major maintenance problem.

Thus the story anent the curved screen. IP would welcome comment from anybody having anything interesting to say on this topic, and particularly from projectionists who have used or, possibly, are even now using a curved screen.

# Historical Sketch of Tv Progress<sup>†</sup>

By L. R. LANKES

Eastmon Kodak Company

*This is a brief review of published material and, in its original form, was an introductory part of a symposium on the various aspects of Tv which will affect the photographic industry. It should be construed as an attempt to convey a general understanding of the subject by considering how the part was pieced together.*

OF ALL the pursuits to which one can turn his attention, perhaps none has aroused a higher degree of curiosity, enthusiasm, and hope than the development of television. It has been said that television holds the promise of being the medium that can bring the peoples of far places emotionally face to face with one another's manners, customs, and problems, and thereby make them understand that they are all essentially human.

It could be said that the motion picture also holds this promise since Tv is essentially motion pictures with radio as the means of conveyance. However, there may be advantages in Tv's claim to immediacy: namely, that what is being viewed at the receiver is occurring now at the transmitter.

## Tv Concept Not Modern

Contrary to general opinion, the concept of Tv is not a 20-century product. Even in Biblical times abstract thinkers predicted that it would be possible to develop the ability to see events occurring beyond the horizon. However, the crystallization of specific inventions which led to Tv as we know it today, began with the transition of the 18th to the 19th century.

The first items are Alexander Volta's electric battery, the voltaic pile; Professor Berzelius' isolation of the element

selenium; Oersted's discovery of the principle of electromagnetic induction; and the efforts of Ampere, Ohm, and Faraday.

The middle of the 19th century might be said to have borne the infant, Tv, for in 1842 Alexander Bain, an English physicist, first proposed a device to send pictures from one place to another by electric wires. Bain's plan was so correct basically that it embraced the fundamentals of all picture transmission, having recognized the particular problems posed by the need for synchronization between transmitter and receiver.

## The 'Copying Telegraph' of 1847

In 1847, Bakewell devised a "copying telegraph" employing an elementary scanning device. Specifically, this was an instrument for transmitting writing or drawings in the form of non-conducting shellac ink on tin foil. The foil was then wrapped around a cylinder which rose as it rotated, thereby tracing out a spiral with a fixed metal needle pressing against the foil. At the receiver, a similar cylinder was covered with chemically treated paper. In 1862, Abbe Caselli transmitted the first electric picture from Amiens to Paris.

The latter part of the 19th century saw the groundwork for the construction of the present video industry. The light-sensitive properties of selenium were discovered in 1873 by a telegraph operator named May. In a terminal station for

the Atlantic cable on the coast of Ireland, May observed the effect of sunlight falling on selenium resistors in some of his circuits. This indicated that light values can be converted into equivalent electrical values.

In 1875, G. R. Carey, in Boston, and Ayrton and Perry, in England, proposed to build a large mechanical eye using a plate of tiny selenium cells as the retina. Each cell would be connected by wire to a corresponding spot on the receiver. Electromagnets connected to each of the small sections of the receiver plate were to regulate the amount of light on each section.

## Cathode Rays, Photoelectric Effect

Many other suggestions, all very similar in principle, were advanced through this period. These were followed by Sir William Crookes' discovery of cathode rays in his famous vacuum tube. In 1880, Leblanc developed the complete principle of scanning wherein a picture is divided into lines and each line into tiny segments. Hertz, in 1886, confirmed Maxwell's theories of electricity and discovered the photoelectric effect in 1887, when he noticed that a spark could be made to jump over a gap more readily if one of the electrodes were illuminated than if the event occurred in darkness.

The German Hallwachs later studied the photoelectric effect systematically and concluded that light set free electrical particles from the electrode surface. Sir J. J. Thompson identified them as electrons, and Einstein announced the theory of the photoelectric effect.

The practical side was advanced by Elster and Geitel who, as early as 1890, built practical photoelectric cells. Thus the method was defined by which a Tv camera would turn a picture into electricity.

As a noteworthy aside, Thomas Edison filmed his first motion picture in 1889; and Marconi, in 1895, sent and received his first wireless signals across his father's estate.

## The Nipkow Scanning Disk

Coincidental with these latter developments came the invention, in 1884, by the German Nipkow of the rotating scanning disk. This disk made use of the very significant technique, previously suggested, of dissecting the scene to be transmitted into points of light which would then be measured on a time scale in orderly fashion. Nipkow's work ranks high in the history of the medium because he realized so early a system which was not improved upon, basically, for nearly 50 years.

In 1890, the Englishman Sutton proposed a system for a Tv receiver which ranks in importance with Nipkow's sys-

(Continued on page 26)

<sup>†</sup> J. Soc. Mot. Pict. Eng., September, 1948, p. 223.

# Emphasis on the Port Side

By A. BUCKLEY

**S**INCE light is the essence of motion picture projection, the various factors in its production and transmission are of great importance. To deal with one or two links in the transmission of light from its source to the eyes of the audience and ignore other factors is the height of futility. Apart from the questions of correct carbons, arc wattage and mechanical efficiency, the salient points in the optical train are:

1. Light source.
2. Reflector or condenser system.
3. Projection lens.
4. Port medium.
5. Theatre atmosphere.
6. Screen efficiency.

With the exception of item 4, these links in the projection chain have been discussed repeatedly by specialists in each sphere. It is to be regretted that the port medium has not always been recognized as a vital link in the efficient transmission of optical images from the film gate to the screen and thus has seldom received close attention. Let us, therefore, discuss a few details relative to this important element in projection.

## Essential Requirements for Ports

The simple but essential requirements for projection ports are:

- a. It shall be of the correct size and thickness.
- b. Its surface shall be perfectly plane, highly polished, and free from scratches or other marks.
- c. No distortion or color shall be present in the medium.
- d. The surface of the medium shall be at exact right angles to the optical axis.
- e. The medium shall be scrupulously clean.

The requirements for an observation port, while not so critical, still are of great importance. Here they are:

- a. It shall be of sufficient size to permit an unobstructed view of the screen from a position midway between the rear of the arc lamp and the front of the projector.
- b. No reflection from the rear wall shall be visible in the port medium, and
- c. No color content or distortion shall be present in the medium.

## Standardization of Sizes

These requirements, reasonable though they be, are not commonly met. Not only are ports of the wrong sizes and spacings, but any kind of glass, irrespective of quality, very often finds its way into the port apertures.

Since a projector is a fixed object, there is little point in having an extremely

large projection port except where a slide lantern shares the same aperture. While the medium must be larger than the projected image, there seems to be little reason, except in extreme cases, for using a port 12 x 12 inches for the transmission of an image 4 x 3 inches.

For various reasons, particularly cleaning purposes, the projection port medium should be fitted on the inside of the dividing wall, and the size (actual glass area) should rarely exceed 6 x 4½ inches for one projector. Where the medium is fitted to the auditorium side of the dividing wall it must, of course, be a little larger, but in any event very little larger than the picture image.

Observation ports, on the other hand, are rarely large enough for convenience and ease of screen viewing. Projectionists are not fixed objects; they must move about a little and be able to see the complete screen from more than one position. It should not be necessary to hold one's face close to the glass in order to see the full width and height of the screen.

The solid angle existing between the lens and the screen determines the minimum size to permit adequate observation, and it is suggested that no observation port (again, actual glass area) be less than 10 x 7½ inches, nor larger than 12 x 9 inches.

Projectionists agree almost unanimously that a spacing of five feet between the optical axes of two regular projectors is a reasonable one: this allows ample working space for operation, cleaning, lubrication and service. For a level, or nearly so, projection angle, the optical axis should be at a height of approximately 4½ feet from the floor level, depending upon the degree of projector angle (Table 1).

With more acute angles of positive and negative angle, the height of the port will vary somewhat. As the average eye level is slightly more than five feet from the floor, the center of the observation port should be about five feet high, circumstances permitting. The displacement between the centers of the projection and companion observation ports should be about 18 inches.

## Suitable Medium for Ports

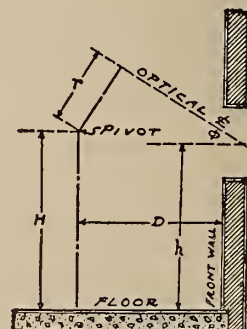
From the early days of motion pictures, glass, in some form or other, has been the universal medium for projection and observation ports. More recently, plastic sheet has been tried, but since its surface is so easily scratched or damaged, it does not compare favorably with glass.

One notable point about plastic, however, is that dust appears to be repelled by electrostatic charges in the material. Glass, on the other hand, seems to attract

TABLE 1. Approved Method for Locating Projector Port

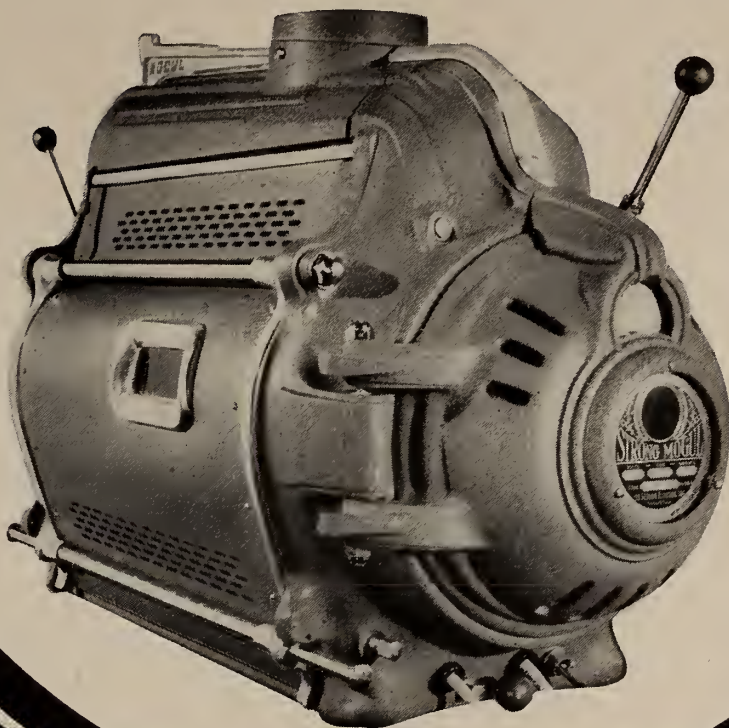
$$h = H + rA - DB$$

Projection Angle°	A	B
0	1.00	0.00
2	1.00	0.04
4	1.00	0.07
6	1.01	0.11
8	1.01	0.14
10	1.02	0.18
12	1.02	0.21
14	1.03	0.25
16	1.04	0.29
18	1.05	0.33
20	1.06	0.36
22	1.08	0.40
24	1.09	0.45
26	1.11	0.49
28	1.13	0.53
30	1.16	0.58



$H$  is the height of the center of the projector pivot from the floor;  $r$  is the radial distance of the optical centerline above the center of the pivot;  $D$  is the distance of the center of the pivot from the front wall of the projection room;  $\phi$  is the angle of projection; and  $h$  is the required height of the center of the port from the floor of the projection room. Select the values of  $A$  and  $B$  corresponding to the angle of projection, and substitute in the formula.

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every airborne particle of dust and fluff. We shall therefore confine our observations to glass, good or bad.

Apart from meeting statutory requirements relative to smoke and fire, the port glass serves to prevent mechanical noise from the projection room reaching the auditorium. Its most important role, however, is to transmit an undistorted image from the lens to the screen.

In this process (a) the light loss should be slight; (b) there should be no trace of distortion in the glass; (c) the faces of the glass should be perfectly parallel and plane, and (d) the reflection on the projection room side of the glass should be as low as possible.

Window glass, sometimes used, is entirely unsuitable for this purpose. It is too thin, possesses color content, and is responsible for image distortion. Plate glass, while usually of good quality and free from distortion, has a fairly large transmission loss. Its reflectivity, however, is understood to be lower than true optical glass.

#### **Type of Glass; Light Transmission**

When using plate glass, quite a large percentage of light loss can be expected, even when the glass is clean. The additional losses when dust, and maybe grease, are present cannot be accurately estimated.

Optical glass does not distort: it transmits a perfect image, but its surface is so highly polished that increased reflection takes place. It is suggested that this reflection could be minimized by surface treating, but here difficulties might arise regarding the satisfactory cleaning of its surface.

From elementary observations of refraction through glass it is known that when light rays meet the glass at *exact* right angles they pass straight through the glass, i.e., there is no displacement.

When, however, light rays meet the glass surface at any other angle, the rays are bent towards the normal as they pass through the glass; while on emergence they then take up a similar, but displaced, course. Now, since the modern projection lens is indeed a precision instrument—exact glass combinations, finite spacings and extreme accuracy throughout—clearly many of these desirable points are neutralized to some extent by incorrectly-angled port glasses.

The foregoing observations indicate that to obtain maximum efficiency the plane surface of the glass should be at *exact* right angles to the optical axis of the projector.

When using certain types of arc lamps much stray light occurs on the rear wall of the projection room. Very often this defect has been minimized by tilting the observation port up or down. It is suggested, however, that the real cure is for

an asbestos curtain or specially designed metal sheet to be placed at the rear of such a lamp; the port glass can then be fitted so that a better screen image may be seen.

#### **Proper Maintenance of Ports**

The necessity for cleaning projection and observation ports is a point very often overlooked by architects and others. To anyone not well versed in the art, the port glass is often a minor point in the general projection scheme. That is why, not infrequently, any old piece of window glass, or even worse, is immovably fixed on the auditorium side of the dividing wall.

In many cases steps or ladders must be used to make some pretense of cleaning them. Any projectionist would tear his hair at the thought of such an idea; but

often he has no control over the matter and he must make his daily journey up the ladder and attempt to clean them. Often he may even forget to do so.

The projection engineer will rightly *insist* that projection and observation ports be fitted in metal frames, so that they can instantly be detached for cleaning. He will also specify true optical glass of the regulation thickness. The intelligent projectionist will devote exactly the same attention to his port glass that he gives to his lens—correct and frequent cleaning treatment.

If these notes serve to awaken an interest in the real importance of the port glass and its function—perhaps to many who have long regarded this unit as a necessary evil—it will have served its purpose. Any port might do in a storm, but certainly not in a projection room.

## **Sound Kodascope FB-40 Projector Again Available**

**T**HE most powerful of Kodak's line of 16-mm sound projectors—the Sound Kodascope FB-40—is again available after an absence of several years. Extremely simple to operate and control, it produces large, clear, smooth-running movies, accompanied by undistorted sound from the film track, from records, or from a microphone.

The amplifying system has a full 40-watt capacity, which reserve power adds to the effectiveness of undistorted sound in projection. True pitch, especially important in the reproduction of music, is maintained by the use of an oil-coupled flywheel on the sound drum shaft. Also utilized is Kodak's exclusive built-in fidelity control which permits accurate focus of the scanning beam on either surface of the film, thus assuring equally excellent sound with either original or duplicate films.

The projector is supplied with a twin 12-inch speaker unit, more than adequate to handle the 40-watt output provided. The

unit, when closed, forms a compact, easily portable case and, when opened, the speakers may be operated together at an angle or separated by several yards for best audience coverage. Twenty-five- and 50-foot lengths of 2-wire speaker-to-speaker extension cord are available as accessories.

#### **Many Unusual Operational Features**

An unusual feature is twin jacks, with separate controls, on the amplifier so that a microphone and/or a phonograph recording may be plugged in to provide sound in conjunction with silent films. The microphone and/or phonograph may also be used with the sound track of sound films if it is desired to add a running commentary or special music. The system may also be used for public address purposes.

The projector operates from within its own carrying case, and the detachable upper section of the case provides a projection stand supported on four sturdy, rubber-tipped feet, which can be placed on any table. With the operating side of the case open, everything required for normal sound-film operation is within easy reach.

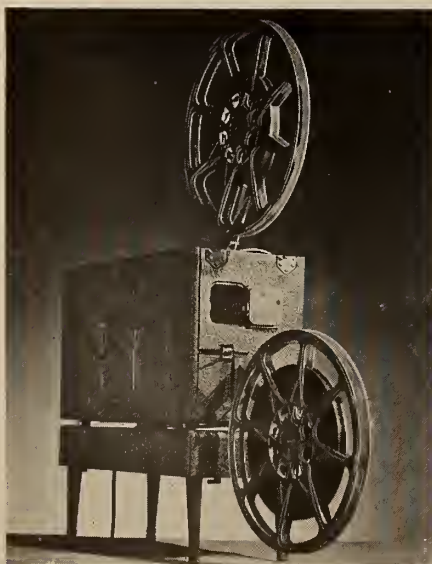
A lumenized Kodak projection Ektanon 2-inch, f/1.6 Lens is standard equipment with the projector. However, five interchangeable accessory lenses, ranging from a 1-inch, f/2.5 wide angle to a 4-inch, f/2.5 lens for maximum distance throws, may be obtained separately. A 1600-foot reel is provided, although the reel arm will accommodate reels holding up to 2000 feet.

The projector is designed for 110-125-volt, 60-cycle a-c operation. A 100-foot long cable for connecting speaker and projector is also provided. Additional cable may be obtained.

#### **Filter Changes Color, Not Intensity**

A new filter which is fitted over photo-flood lamp reflectors has been developed by Acme-Lite Mfg. Co., Chicago. Trade-named "Litefilter," the device is said to filter out destructive yellow and red light rays. By its use the color and character of the light is changed without reducing light intensity.

The Kodascope FB-40 sound-film projector again made available by Eastman Kodak.



# Ultrafax: New Communications Marvel

**U**LTRAFAX, a newly developed system of television communications capable of transmitting and receiving written or printed messages and documents at the rate of a million words a minute, was demonstrated publicly for the first time by RCA at the Library of Congress, Washington, D. C., on October 21.

The development, which splits the seconds and utilizes each fraction for high-speed transmission of intelligence, is held to be as significant a milestone in communications as was the splitting of the atom in the world of energy.

Among the possible developments of this new system are the following:

## Possible Uses of the System

1. The exchange of international television programs achieved on a trans-oceanic basis.
2. A service of television and Ultrafax by which the same receiving set would bring various types of publications into the home, or a newspaper for that matter, without interrupting the program being viewed.
3. A system of world-wide military communications, scrambled to the needs of secrecy, which with ten transmitters could carry in 60 seconds the peak load of message traffic cleared from the Pentagon Building in 24 hours during World War II.
4. The establishment of great newspapers as national institutions by instantaneous transmission and reception of complete editions into every home equipped with a television set.
5. The transmission of a full-length motion picture from a single negative in the production studio simultaneously to the screens of thousands of motion picture theatres throughout the country.
6. The possibility of a new radio-mail system with the vast pickup and delivery

## Lorraine Carbon Designation

The designation of Lorraine carbons as "French carbons" is misleading and has given rise to numerous misconceptions regarding the physical character and performance of the Lorraine product, according to Edward Lachman, president of Carbons, Inc., distributors for the U. S. A. Especially prevalent is the identification of the Lorraine with the old Sun-Arc carbons which were sold in the U. S. in pre-war years, said Lachman, who asserts that Sun-Arc carbons are no longer being manufactured.

Regarding inquiries as to the available supply of Lorraine carbons in this country, Lachman emphasized that an ample supply of all trims is warehoused at Boonton, N. J., and that all orders, irrespective of quantity or type of carbon, are accorded immediate delivery.

services of the Post Office Department.

The demonstration proved the ability of Ultrafax to transmit at the speed of light—186,000 miles a second—a wide variety of graphic material including charts, fingerprints, news and advertising layouts and items ranging from historical documents to complex atomic formulae and battle maps.

A striking feature of the demonstration came when the 1047-page novel "Gone With the Wind" was transmitted word for word in its entirety in about two minutes from the transmitter to the receiver in the Library of Congress.

During the demonstration, messages, technical drawings and other material in foreign languages were among the numerous items transmitted by Ultrafax directly from the tower of the NBC's television station WNBW at the Wardman Park Hotel through the air to a receiving terminal on the stage of the Library of Congress, a distance of three miles. In a regular service the transmissions could be radio-relayed any distance across the country, using the commercial radio-relay system towers which now are being erected to establish national television networks.

## Motion Picture Distribution

Said David Sarnoff, RCA board chairman: "It is now within the compass of one's imagination to foresee the day, when through television and Ultrafax, a radio newspaper may be delivered

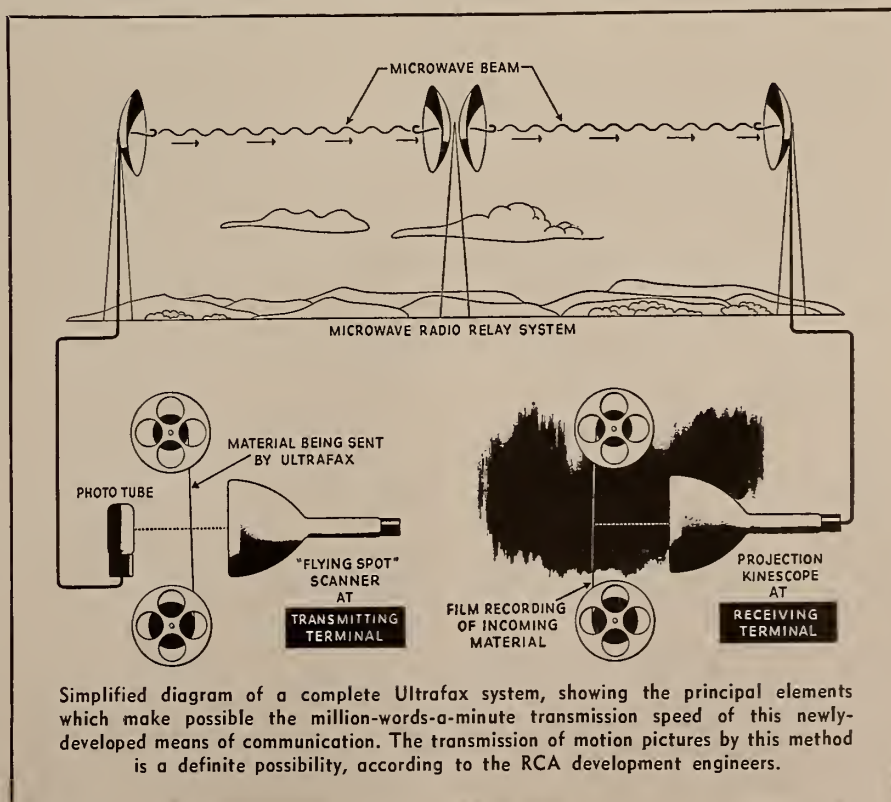
through the air into every home equipped with a television set. It would be possible to have the same transmitter that broadcasts the television program simultaneously broadcast the radio newspaper. In fact, the same home-receiver, with proper attachments, could print the newspaper even without interrupting the program being viewed."

Further, he said it seems only reasonable to expect, as the present system of Ultrafax progresses, that it may be possible to transmit full-length motion pictures from a single negative in the production studio simultaneously to the screens of thousands of theatres throughout the country. This, he added, would provide a new system of motion picture distribution.

## Principal Transmitting Steps

"We can foresee the day," he continued, "when Ultrafax, which includes television and radio relays, can provide us with a new service of international television. But first, an 'airlift' must be provided across the Atlantic. Even now by the use of 12 to 14 suitably equipped communication planes flying over the ocean and properly spaced, an overseas airborne radio-relay system could be established between the U. S. A. and Europe that would provide not only an exchange of television programs, but also handle the equivalent of tons of mail, news and other services which Ultrafax makes possible."

Ultrafax's remarkable speed, the engineers explained, is possible because full pages of information are transmitted as



television pictures at the rate of fifteen to thirty a second. The principal steps in the Ultrafax process are:

1. Preparation of data to be transmitted, to assure a continuous flow at high speed.

2. Scanning of this data by what is known as a flying-spot television scanner, at the sending terminal.

3. Transmission of the television image as ultra-high radio-frequency signals over a microwave relay system.

4. Reception on projection-type television kinescope, or "picture tube," from which incoming messages are recorded on motion picture film, or ultimately directly onto photographic paper.

At the end of a transmission, the ex-

posed film can be transferred quickly to a special processing unit developed by Kodak. The film is passed through a miniature developing tank, rinsed and fixed in less than 15 seconds and dried in 25 seconds more. This unit, regarded as an important advance in photographic art, resulted from advance equipment built for the armed services during the war.

The Ultrafax film may be enlarged to full-sized copy by means of a high-speed continuous processing machine. The equipment is similar to that used during the war for V-mail enlarging. There is no limit to the number of Ultrafax messages which may be printed from a single film.

and succeeded in maintaining a balanced density in both long shot and closeup.

In using only the red filters it is well to remember that all reds in the scene are consequently highlighted in color and with a corresponding degree according to the filter used. All props normally containing red, such as flags, insignia, *etc.*, should be replaced with duplicates in which the red colors have been replaced by light or medium brown, and the filters for the shot carefully selected.

In balancing connecting shots, the sky should also come in for careful evaluation in the selection of filter to be used for long and close shots. A ground haze can cause serious trouble if shot in a backlight or back cross-light. Where haze prevails, a few test shots developed on the spot will indicate the best filter to use, and at the same time convince you of the value of infra-red film for getting dramatic pictorial effects that would not be possible under the same conditions with any other emulsion.

#### **Application to 16-mm Field**

For the 16-mm moviemaker, amateur or professional, infra-red film offers many possibilities, both pictorial and time-saving. Where the filmer has not the lighting facilities to photograph actual night shots, infra-red and filters will enable him to photograph such shots in daylight. The 16-mm professional will find many uses for the film to enhance production values—something he can easily prove by making a few test shots.

There is no definite emulsion speed indicated for infra-red film for use in daylight. Recently I contacted Eastman's representative, who was visiting in Hollywood, but could get no definite information regarding this.

#### **Corning Photo-Sensitive Glass**

An article descriptive of the development, characteristics and applications of photo-sensitive glass appears in the July 1948 issue of the *Journal of the Physical Society of America*. The author is Dr. S. D. Stookey, research chemist for Corning Glass.

Photo-sensitive glass is described as an optically homogeneous medium having the properties of typical clear glass, yet capable of incorporating a photographic image after exposure to ultraviolet light and to heat. Controlled colors of images include red, yellow, blue, purple and amber.

Applications are found in the fields of portrait and scenic photography, jewelry, murals, windows, optical instruments, instrument dials, lantern slides, sound tracks, and lighting devices.

#### **Why Silver is 'Metallic Nobility'**

Silver is called a "noble" metal because it is "incorruptible", meaning that it resists acids, chemicals and corrosion. That is the chief reason why silver has so many and such varied industrial uses.

## ***From the Production Front***

### **Expanding Use of Infra-Red Film**

By ARCHIE STOUT, ASC

THE NATION'S movie critics who have been so generous with praise for the photography in "Fort Apache," and the millions of moviegoers who have seen the film to date, probably do not know that a total of 10,000 feet of infra-red film went into making the dramatic outdoor sequences that mark the picture. In all probability there is more actual infra-red footage in "Fort Apache" (2,800 feet in the final cutting), than in any other theatrical production released to date.

The uses for infra-red film are as varied as the types of present-day pictures. It affords the progressive cinematographer many opportunities to achieve striking dramatic and pictorial effect shots that can be made in no other way. At the same time, it permits carrying on smooth continuity of photography by using the same film in medium and closeup shots.

John Ford's "Fort Apache," with so much of its action laid in the pictorially beautiful region of the great Southwest, was particularly suited to the use of infra-red film. The vast expanse of blue, cloud-flecked sky, when emphasized by use of this film and filters, provides a dramatic backdrop for the story's teeming action.

#### **Most Advantageous Lighting**

Normally, I found that the most advantageous light conditions for shooting infra-red is a cross or slightly-front cross light, using a stop of f/5.6 to f/8 and a 25A filter. Of course, this is not a definite rule, but will give a working start that your test box can prove or disprove in ten minutes, and result in making corrections to suit one's needs.

It may be interesting to note that the

dawn sequence in "Fort Apache" in which the troops are seen moving across the desert was shot while a light rain was in progress, using a 29F filter and a stop of f/3, indicating that the film is not restricted to use only in brilliant sunshine.

Probably the reason more directors of photography have not used infra-red film more often is the fact that much of the first infra-red was marked by unstable balance. For example, two rolls of early-day infra-red film shot at the same f/ stop and under the same conditions—and within an hour—would have a very wide difference in density, so much so, that they would be practically unusable. Such hazards do not prevail with present day infra-red film. The density of the 10,000 feet used in "Fort Apache" remained quite constant throughout.

Other cinematographers may be interested in pertinent facts concerning this far too little used film stock, some of which were obtained only after considerable trial and error.

#### **Makeup Changes Indicated**

In shooting closeups in which players appear, a very light brown makeup should be used in combination with dark brown rouge for the lips, instead of the customary red. The brown makeup prevents "chalking" of the features. In "Fort Apache," no makeup of any kind was used except in the infra-red shots.

The shades of brown makeup will vary with the filter used, which should be a 23A, 25A, and, rarely, a 29F. Choice of filter will depend entirely on the background, sky and clouds. In several instances I used a 23A filter and then shot the scene to follow using a 29F filter,

# Flicker in Motion Pictures

**C**ONTINUING his extensive investigation into the causes and correction of flicker in motion picture projection, Loren D. Grignon (20th Century-Fox Studios) makes a further contribution to the literature on the topic in a paper in the current *SMPE Journal*.<sup>†</sup> Exhaustive tests carried out are described—including data as to their nature, the equipment used, and the conditions under which they were made—and the Grignon paper contains observations and conclusions, excerpts from which are appended hereto:

Before proceeding with a program of tests, a flicker-free projector was needed to evaluate the flicker samples visually. Flicker in projectors is caused by (a) shutter rate, (b) nonuniform shutter velocity, (c) arc-supply ripple, and (d) arc-burning characteristics.

The effects of (a) are generally known. Most projectors are supplied with two-bladed shutters producing a 48-cycle shutter rate which is sufficiently high, at present illumination levels, to be of secondary importance.

## Multi-Blade Shutter Requisites

In studio review rooms a three-bladed shutter frequently is used. No studies were made of two- versus three-bladed shutters. One point concerning shutters should, however, be made. Any multi-bladed shutter must be symmetrical, otherwise the 24-cycle frame rate is reintroduced and frame flicker becomes apparent.

The shutter used for all visual work consisted of three 93-degree blades and three 27-degree openings. It is currently used in all studio review rooms at 20th Century-Fox.

Nonuniform shutter velocity can result from poor driving motor operation or excessive mechanical backlash between driving point and shutter shaft. Analogously, backlash can be considered as a complex nonlinear compliance which in concert with the masses involved can be resonant. Many cases of long gear trains with large backlash on currently used equipment have been noted with attendant flicker observable in the projected picture.

In order to evaluate the seriousness of the shutter nonuniformity, a temporary filtered shutter was devised and applied. The design was not wholly satisfactory because of an insufficiently low cutoff frequency, but it served to demonstrate that the higher-frequency flicker components could be noticeably attenuated.

## Arc-Supply Ripple Worst Offender

This part of the work has not progressed beyond this point. It is, however, clear that projector improvements either should include shortened gear

trains with a minimum of backlash or some type of damped or filtered shutter.

Arc-supply ripple is the worst source of flicker. Any 60-cycle component greater than 0.15% will cause a 12-cycle flicker resulting from beats between the 60 and the 48 cycles of a two-bladed or the 72 cycles of a three-bladed shutter. Supplies operating from 50-cycle sources do not produce the same result since the beat frequencies are 2 and 22 cycles, respectively.

Unfortunately, it has generally been considered that three-phase rectifiers and motor-generator sets require filtering only for the theoretical higher frequencies prevalent and that any 60-cycle com-

ponents are low enough to be neglected. This is not true.

Consider the three-phase rectifier. Either unbalanced line voltages or differences in rectifier element voltage drops will introduce line-frequency components and these must be safeguarded against by some filtering which is effective at such frequencies. Motor-generator sets can also contain line-frequency components resulting from armature slots or rotational effects. Six-phase rectifiers are superior in this regard because they tend to contain less 60-cycle components.

In view of the foregoing remarks, the cure is obvious, but it is surprising to learn that single-phase rectifiers having insufficient filtering are used for arc supplies.

## Additional Series Inductions

To eliminate the difficulties from 60-cycle ripple, all studio projectors employing three-phase rectifiers for arc supply are being equipped with addi-

(Continued on page 25)

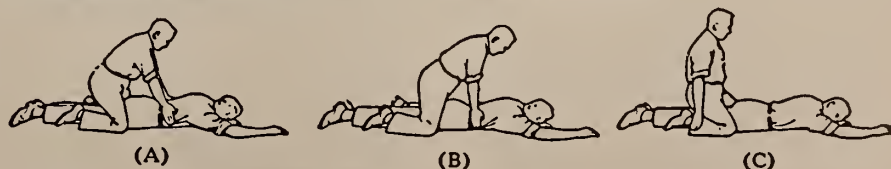
## Effective First-Aid in the Event of Electric Shock

**T**HE fact that voltages employed in television equipment are sufficiently high to endanger human life is stressed in a recent bulletin issued by RCA on its new TP-16A Tv film projection equipment. Pointing out that every reasonable precaution has been observed in design to safeguard operating personnel, RCA advises that power be removed completely before changing tubes or making any internal adjustments.

Supplementing this warning are instructions anent first-aid treatment in case of electric shock. IP believes that these instructions merit the widest possible dissemination. Here they are:

### Step-by-Step Procedure

1. Protect yourself with dry insulating material.
2. Break the circuit by opening the power switch or by pulling the victim free of the live conductor. Don't touch victim with your bare hands until the circuit is broken.
3. Lay patient on stomach, one arm extended, the other arm bent at elbow. Turn face outward resting on hand or forearm.
4. Remove false teeth, tobacco or gum from patient's mouth.
5. Kneel, straddling patient's thighs (see A).
6. Place palms of your hands on patient's back with little fingers just touching the lowest ribs.
7. With arms straight, swing forward gradually bringing the weight of your body to bear upon the patient (see B).
8. Swing backward immediately to relieve the pressure (see C).
9. After two seconds, swing forward again. Repeat 12 to 15 times per minute.
10. While artificial respiration is continued, have someone else:
  - (a) Loosen patient's clothing.
  - (b) Send for Doctor.
  - (c) Keep patient warm.
11. If patient stops breathing, continue artificial respiration. Four hours or more may be required.
12. Do not give liquids until patient is conscious.



<sup>†</sup> "Further Flicker Studies," J. Soc. of Mot. Pict. Eng. for December, 1948. No. 555.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**D**ESPITE the moaning and groaning by certain segments of the motion picture industry, it is worthy of note that several distributors have discontinued co-operative exhibitor advertising because "intensive and extensive research has revealed that the country's theatres are *earning a heavy profit*" and thus are able to assume the entire burden of local advertising. While box-office income undeniably is below the lush take of, say, 1946-47, overall attendance and income figures still are able to support Messrs. Distributor and Exhibitor in the plush style to which they are accustomed.

Inter-industry moaning is regarded in certain quarters as inspired by the desire to effect slashes in employment rosters and wages; while the quips by those oracles outside the industry add up to typical know-nothing comments by irresponsible columnists.

The well-informed know that two major factors are contributing to the slackened production pace in Hollywood: (1) the heavy backlog of pictures made but not yet released which the producers wish to amortize before embarking on new ventures, and (2) the growing number of reissues, the character of which the patron frequently does not discover until he has gained admittance to the theatre at regular box-office prices.

Add to the foregoing the fact that no less than 65 features will be made abroad by American interests within the next year, and we have a prime cause for unemployment by Hollywood acting talent and technicians.

- IA President Walsh has been named to a five-man committee which will supervise changes in the by-laws of Labor's League for Political Education. Proposed changes in the by-laws will permit the League to accept 10-cent contributions from all AF of L members to finance a 14-month political education drive.

- Lester B. Isaac, projection supervisor for Loew's, Inc., was appointed technical director for the "gala" and ball that will mark President Truman's inauguration January 19-20. Lester, one of the ablest technicians in the industry, will direct

the installation of lighting and sound effects.

- Local 380, Oklahoma City, Okla., will celebrate its 34th anniversary the latter part of next month.

- The regular December meeting of Local 164, Milwaukee, Wis., was devoted almost exclusively to the showing of two very interesting and instructive motion pictures—"The History of the IA" and National Carbon Company's Technicolor feature "Carbon Arc Projection." Both films were enthusiastically received by the members.

A talk by C. E. Heppberger, technical specialist for National Carbon, preceded the showing of the carbon picture; John Lysaght and G. W. Overall, field representatives for the company, were also present. Ampro equipment, furnished by Wisconsin Sound Equipment Co., was used for both films.

- Floyd Blackman, president of Local 399, Bartlesville, Okla., and 1st vice-president of the Oklahoma Federation of Labor, attended the Federation's recent executive board meeting held in Oklahoma City.

- Recent out-of-town visitors to the offices of IP: Dick K. Chastain, member of Local 322, Charlotte, N. C., who spent the holidays visiting his daughter in New Haven, Conn.; Ralph Grimes, secretary of Local 224, Washington, D. C.; Walter Roberts, Local 178, Salisbury, N. C., and John Romansky, Local 645, Rockland County, N. Y. From Local 223, Providence, R. I., came the Slaters—Harvey, Lester, Herbert F., Jr.—and Arthur Jackson. The Providence delegation came to this city for the express purpose of getting a line on behind-the-scenes activities at television stations. Arrangements were made for them to visit the *Daily News* tele station WPIX, and with the able assistance of the projectionist on duty, L. Menasche, member of Local 306, we think these men gleaned enough information to render a comprehensive report to their membership.

- We were stunned to learn of the untimely death of our very good friend, Harry F. Petty, 52, member of Local 163, Louisville, Ky. He died early last month

of a heart attack while working in the projection room of Loew's Theatre, where he had been employed for the past 20 years.

Harry Petty had a long and colorful career as a labor leader and was a popular figure at trade union meetings and conventions. At the time of his death he was president of the Kentucky State Federation of Labor and was editor of the *Kentucky Labor News*. He was also vice-president of the Louisville Central Labor Union. Harry served for many years as an officer of his Local, and was a delegate to a number of IA conventions. He is survived by his wife and a brother, Samuel Petty.

- Ben Hull, Local 186, Springfield, Mass., associate director of the State Department of Labor and Industries, and vice-president of the Massachusetts State Federation of Labor, delivered a forceful and educational talk on the results of the recent national election to the delegates attending a Central Labor Union meeting early last month. He characterized the results as the greatest victory ever won in the history of organized labor, and warned his listeners to be on their guard against the enemies of labor who would rob them of their hard-earned benefits gained during the last 25 years.

- T. Robertson, vice-president of Local 105, London, Canada, and projectionist at the Granada Theatre in St. Thomas, received high Masonic honors last month when he was elevated to the coveted office of Worshipful Master of St. Thomas Lodge No. 44, AF & AM.

- Protracted negotiations between Pittsburgh Local 171 and the chain theatres in its jurisdiction—Warners, Loew's, Harris and Shea Theatres—were ended recently with the signing of new three-year contracts providing for wage increases from 7½ to 12%, retroactive to September 1, 1948. IA representative Fitzgerald assisted the Local in the negotiations.

- One of the highlights at the 45th anniversary party recently given by Local 105, London, Canada, was the awarding of gold life membership cards to charter members Joseph Moran and George

Cowie. William Neuman, member of the Local for 45 years, was presented with a gold IA ring.

- The IA General Executive Board will hold its mid-winter meeting at the Roosevelt Hotel, New Orleans, La., the week beginning January 31.

- J. Pries, business agent for Local 225, Atlanta, Ga., was unanimously re-elected to office for his third consecutive term. His popularity with the membership has grown steadily the last few years and it was further enhanced when, despite existing contracts which do not expire until 1951, he was instrumental in gaining for his membership cost-of-living increases each year for the past three years. Jake has long been a strong advocate of keeping management-labor relations on a friendly and cooperative basis, and he believes that all differences between these two groups can be settled amicably if both sides adopt a give-and-take attitude.

- Wm. Reed, charter member of Local 310, Atlantic City, N. J., was recently presented with a gold life-membership card in the Local. Reed is now in his late 80's and claims to be the oldest projectionist in the business.

- News of the sudden death early this month of Eugene Granada, 40, shocked his many friends in the Alliance. He was a member of Local 366, Westchester Co., N. Y., and had been employed as an electrician with the Broadway hit play "A Street Car Named Desire." Gene was a son-in-law of Joe Monaco, business agent of Local 366, and served with the Army Air Corps in the recent World War. We extend our deepest sympathy to his widow, Dorothy, and to his other survivors.

- George Tradd, member of Boston Local 182, has opened his own projection equipment repair shop at 11 Winchester Street, Boston. Tradd, a skilled technician, was chief mechanic for many years with the Theatre Service and Supply Co. We join a host of others in wishing him luck in his new venture.

- Local 380, Oklahoma City, Okla., placed one of its members with the Oklahoma Theatre Supply Co. under the terms of a new contract which calls for a five-day, 40-hour week at \$2.25 per hour, plus vacations with pay.

- We were happy to learn that A. S. Johnstone, New Orleans Local 293 and an IA representative, has completely recovered from a threatened attack of pneumonia. Al was stricken while attending a business conference in Charlotte, N. C., and was confined to his hotel room for several days until Mrs. Johnstone came up from New Orleans to take him home.

## Spotlighting 1948

- Floyd Billingsley and Tony Noriega, San Francisco Local 162, appointed to important State posts by Governor Warren of California . . . Ralph Grimes, Local 224, Washington, D. C., named a member of the District's Motion Picture Operators' Examining Board . . . Los Angeles Local 150 settled long-standing wage negotiations with major theatre circuits. Agreement provided for 20c per hour increase, retroactive to July 1, 1947 . . . Allen G. Smith succeeded James Frank, Jr. as New York City branch manager for National Theatre Supply Co. . . . Charlie Dentelbeck, projection chief for Canadian Famous Players, played the good samaritan to ailing projectionists . . . San Antonio Local 407 presented Fred Raoul, IA general secretary-treasurer with gold membership card . . . Abe Zumar and Bill Hartnett, secretary and business manager, respectively, of Local 257, Ottawa, Canada, reelected to office for their 23rd consecutive term . . . E. P. Lehnhoff, Local 548, Paris, Texas, formulated a plan to keep his members abreast of technical developments in the industry . . . Economy drive instituted by Hollywood producers. Salaries of top executives in several of the major companies were substantially increased, while employees in low-income brackets were hard hit by wholesale layoffs.

Hotly contested election in New York City Local 306. Ernie Lang nosed out Frank Inciardi for the post of recording-secretary by only one vote . . . Chicago Local 110 signed contract with tele station WGN. The only other tele station in Chicago, WBKB, also under contract to the Local, thus making that city 100% IA . . . Bert Sanford, theatrical sales manager for Altec, appointed to motion pic-

ture committee for 1948 Appeal of the New York Catholic Charities . . . International Projector Corp. played host to 25-30 Club members at its new plant in Bloomfield, N. J. . . . Boston Local 182 purchased three-story building to house union headquarters . . . Members of Pittsburgh Local 171 agreed to donate services to bed-ridden veterans at Aspinwall Hospital, in the showing of motion pictures twice weekly . . . Brooklyn Local 4 celebrated its 60th anniversary . . . The death of Thad Barrows, Boston Local 182, shocked his many friends throughout the Alliance . . . Dallas Local 249 presented gold membership cards to C. E. (Red) Rupard, Henry Sorenson, and Johnny Hardin . . . Tom Loy, public relations counsel for the IA, became the father of a seven-pound boy . . . George Thrift, Vancouver Local 348, took his family to visit his birthplace in England—his first trip back in 25 years . . . Mike Berkowitz and Cecil Wood, Sr., New York Local 306, celebrated their 75th birthdays . . . Earl Tuttle, Local 396, Binghamton, N. Y., elected vice-president of AF of L's Union Label Dept. . . . Sam Kaplan, New York Local 306, died.

Gene Atkinson, Chicago Local 110, obtained sweeping welfare benefits for his members in unprecedented 5-year security and pension pact with exhibitors . . . Local 414, Wichita, Kans., signed up the Fox Theatres at a 15% wage increase, plus time-and-a-half for overtime and two weeks vacation with pay . . . Dick Walsh and the entire official family unanimously reelected to office at the 39th biennial IA convention . . . Tom O'Brien, general secretary of NATKE, guest at the Cleveland convention . . . Documentary film, "The History of the IA" shown to the delegates at Cleveland . . . Bill Canavan, former International president, observed his 60th birthday . . . National Carbon Co. took the wraps off its Technicolor film, "Carbon Arc Projection" at a special showing in New York . . . Walter J. Kunz, Local 279, Houston, Texas, died shortly after his return from Cleveland . . . Los Angeles Local 150 scored a victory over the Board of Building and Safety in its fight to have three of its members reinstated as examiners for the city of L. A. . . . Eastman Kodak Co. splicing chart distributed free of charge to IP readers . . . Dick Walsh presented with gold card at 35th anniversary party of New York Local 306.

Joe Cifre, Boston Local 182 and Chief Barker for Variety Club Tent No. 23, was cited for his splendid efforts in helping to raise more than a quarter of a million dollars for the Children's Cancer Research Foundation . . . IATSE and IBEW reached an agreement on tele-

(Continued on page 23)

## EAGLE-EYED NIMRODS OF LOCAL 143



The 1948 safari of an annual Missouri River shoot again found together Wm. Briley, Wm. Routsong and Adolph Harbstreet, all members of Local 143. The boys got in 18 days shooting during the recent 27-day season.

# Lumens and Electrons

By W. W. LOZIER and F. T. BOWDITCH  
National Carbon Company Laboratories

**D**EFINITIONS in the field of light (the foot-candle, lumen, candlepower, etc.) are based upon a rate of flow of luminous energy, the lumen being analogous to the ampere in this respect. Just as the ampere specifies a rate of flow of current in an electrical circuit, so does the lumen specify a rate of flow of luminous energy through space.

Both of these units are fundamentally concerned with reactions involving single electrons, and, except for the astronomic size of the number required to specify quantities of practical interest, each phenomenon might be expressed in terms of the appropriate single electron behavior. A current of one ampere would thus correspond to a flow of electrons in an electrical circuit at the rate of  $6.28 \times 10^{18}$ , or

6,280,000,000,000,000 electrons per second.

The cumbersome nature of such a specification is apparent, but the picture thus created is nevertheless of value in visualizing what is really going on when current flows.

Similarly, light is generated one photon (one quantum) at a time, as a portion of the energy possessed by an electron is converted to radiant energy of a particular wave-length. The number of these light pulses per second associated with a light source familiar to a projectionist—say, a 70-ampere arc with Suprex\* carbons—is a figure which, like that associated with the ampere, might give an interesting picture of the atomic reaction rates responsible. The derivation of such a figure, however, is quite complicated and requires consideration of the atomic processes from which the light arises.

The electrons, whose energy changes give rise to photons, revolve in orbits around the nuclei of the atoms of which they are a part. There are many orbits associated with a particular nucleus, each characterized by its own energy value. When the atom is in a stable state, its

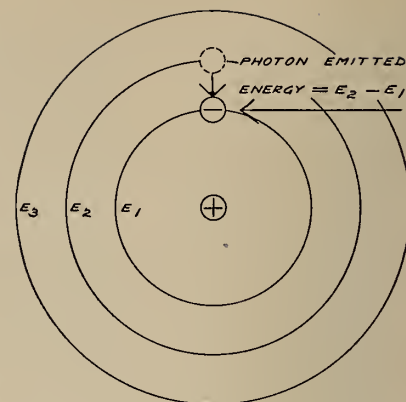


FIG. 1. Showing electron orbits and energy levels around positively-charged nucleus. Electron transitions from outer to inner orbits cause difference in energy to be emitted as radiation.

electrons are all revolving in orbits of relatively low energy.

When the atom becomes "excited," as by heating or as the result of bombardment, one (or more) of its electrons may be given extra energy so that it now revolves in an orbit of higher energy, in which situation it is unstable and will often revert to a lower energy level.

As long as an electron remains in one orbit (or at one energy level) no light is radiated; but when an electron falls into a lower, more stable energy level, closer to the nucleus, the difference in energy between the two orbits is emitted as a photon of radiation. This is diagrammed in Fig. 1 for the simplest atom—namely, the one-electron hydrogen atom. Here the orbits have been shown as circular. Actually, they are often of more complex form, but they are still characterized by the fact that there is a single energy value associated with each orbit.

The amount of energy possessed by a photon determines the frequency of the radiation, according to the following well-known quantum relation so basic to all modern physics:

$$\text{Energy of Photon} = \text{Planck's Constant} \times \text{Frequency of Radiation}$$

The frequency determines the wave-length of the radiation. If the wave-length falls in the range 4000 to 7000 Angstroms, then the radiation is visible. Otherwise, it is either in the infra-red region (if of longer wave-length) or in the ultra-violet (if of shorter wave-length).

A complex atom with more than one electron will be characterized by a multiplicity of possible energy levels and transitions between them, so that the generation of photons of many different energies (and wave-lengths) becomes possible.

## Determination of Color Characteristics

For example, the cerium atoms in the rare earths employed in projector carbons contain no less than 58 electrons. Under the tremendous electron bombardment present in the high-intensity carbon arc, there results such a large number of "excitations" to the many higher levels, followed by the emission of these added energies as pulses of radiation, that practically all wave-lengths throughout the visible region of the spectrum are present in the light which is generated. This results in the snow-white color so characteristic of this arc.

The quantitative expression derived from the above quantum equation and shown in Fig. 2 will enable us to proceed with the task of computing the number of photons

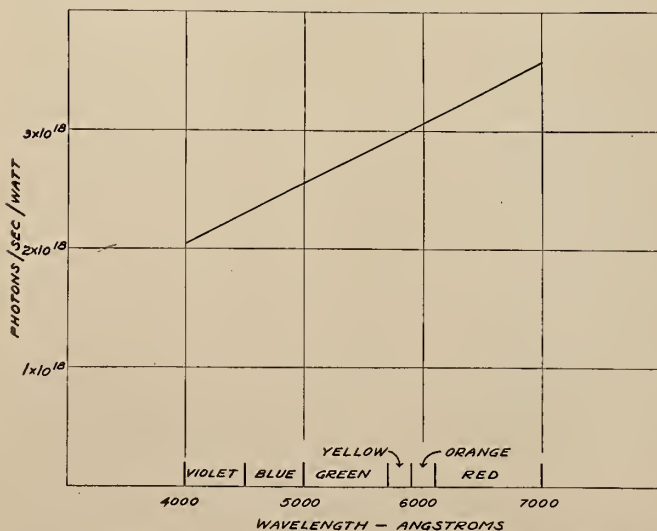


FIG. 2. Graphical exposition of the number of photons per second to produce one watt of radiation of various wave-lengths.

\* The term "Suprex" is a trade-mark of National Carbon Company, Inc.

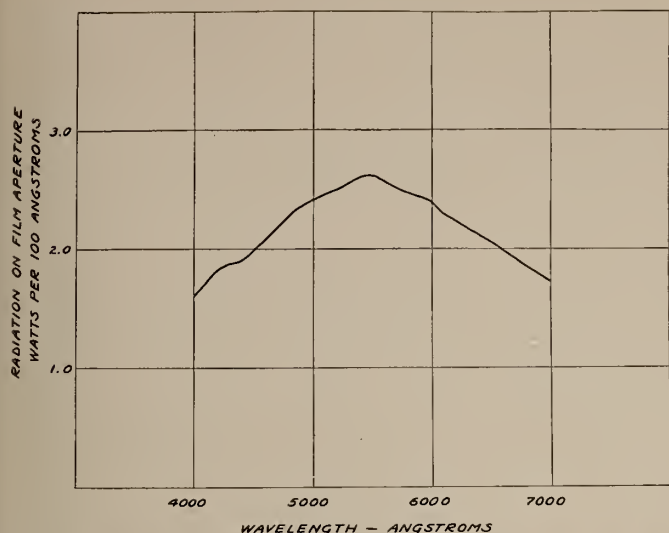


FIG. 3. Spectral energy distribution of radiation through aperture from 70-amp arc with 8-7 mm Suprex carbons—no shutter or filters.

per second associated with the 70-ampere arc with Suprex carbons. This graph shows the number of photons per second required to produce a radiant intensity of 1 watt at each wave-length over the visible spectrum. This ranges from approximately 2 billion billion photons per second at the blue end to approximately 3.5 billion billion at the red end of the band of visible radiation.

The straight-line relation shown in Fig. 2 can be extended at both ends to apply to radiation in both the ultra-violet and infra-red regions of the spectrum.

It is apparent, therefore, that the number of photons per second radiated from any particular light source depends upon how the intensity of that source varies with wave-length, that is, the watts associated with each wave-length radiated. Such information is given by a spectral energy distribution curve and can be combined with Fig. 2 to determine the number of photons per second in the visible range for the source specified. Such a calculation for the familiar 70-ampere projection arc with Suprex carbons, based on the spectral energy distribution curve shown in Fig. 3, results in a figure of approximately

200,000,000,000,000,000,000 or  
200 billion billion photons per second

passing through the film aperture, with no shutter or filters in the light beam. When a count is made of the radiation of all wave-lengths, whether visible or not, it is found that approximately 900 billion billion individual corpuscles of radiation pass through the aperture each second.

#### Light of Varying Wave-Lengths

In order to correlate the rate of emission of photons with more familiar photometric quantities such as lumens and foot-candles, it is necessary to consider the properties

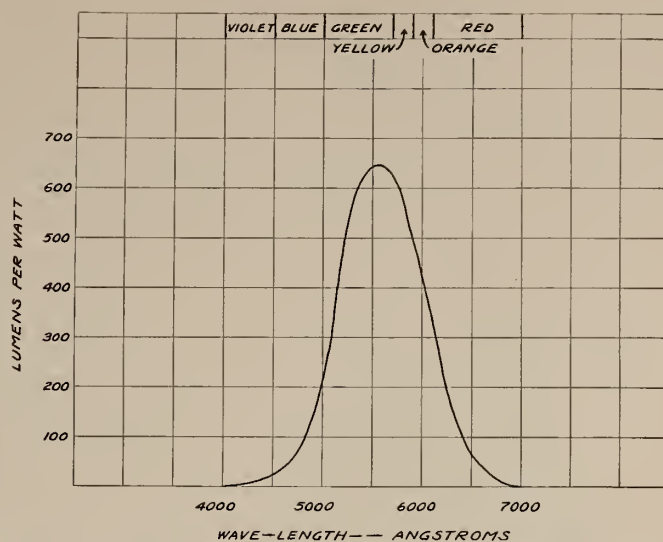


FIG. 4. Visibility curve: showing the number of lumens per watt of radiation of various wavelengths.

of the human eye, since this reacts differently to photons of each wave-length. This relationship is described by the familiar visibility curve shown in Fig. 4. According to this relation, one watt of green light of wave-length 5550 Å produces an illumination of 650 lumens, while both shorter and longer wave-lengths are much less effective, producing zero illumination at the limits of the visible region.

The lumen unit is a measure of the visibility sensation associated with a light source, so that sources of equal lumen output produce equal visual sensation, regardless of color differences. The watt unit as applied to radiation is a measure of its energy content, and sources of radiation possessing the same wattage content will, when absorbed, produce the same heating effect regardless of color.

The visibility curve, when combined with the spectral energy distribution curve for any light source, permits the determination of the lumens associated with the radiation. When this calculation is carried through for the 70-ampere arc with Suprex carbons, it is found that the total illumination falling on the aperture without shutter or filters is approximately 17,000 lumens.\*\*

Combination of this illumination with the previously determined photon frequency results in a value for the 70-ampere Suprex radiation of approximately

50 million billion photons per second per lumen

for all wave-lengths falling on the film aperture. The result of a similar calculation for the 30-ampere, low-intensity carbon arc is also given in Table A.

#### Difference Between H-I and L-I Arcs

Since one electron transition in the arc is associated with each photon emitted, these figures picture the terrific electron activity that the projectionist has under his control and brings into action when he "strikes the arc" and opens the dowser. The threefold greater number of photons, and hence more intense electron activity, required per lumen of illumination produced by the low-intensity carbon arc results from the fact that more of its energy

TABLE A. Number of Photons per Second per Lumen.†

70-Ampere Suprex Carbons	50 Million Billion
30-Ampere Low-Intensity Carbons	150 Million Billion

† Radiation through film aperture.

\*\* Corresponding values of screen lumens are shown under the heading of "Maximum Light" in the last column of Table VIII, page 63, of the National Carbon Co. Handbook on Projector Carbons, 4th Edition.

is in the infra-red region than is the case with the high-intensity carbon arc. This infra-red radiation represents photons and electron transitions which produce no visible radiation.

These huge figures and the methods by which they were derived are obviously too awkward for everyday use. Having thus served their purpose, they, along with the electron rate corresponding to one ampere, can best be

laid aside. For engineering use, the lumen and the ampere continue to be preferred, because they are numerically less cumbersome, and meters are available which permit their determination directly.

A visualization of fundamental processes and involved calculations is not essential to the effective engineering use of such data. A glance at the basic picture once in a while is sufficient.

### New RCA Seat-Phone System

A new line of theatre seat-phone equipment for the hard-of-hearing is now available from RCA. The equipment (PG-130C) features a tamper-proof single jack box having no exposed screws or nuts for mounting on the rear section of a chair arm or on the metal partition just under the arm.

To simplify installation, a six-foot length

of armored cable is clamped into each jack box, which consists of two cast aluminum sections joined by an Allen set screw inside the housing. An Allen wrench, supplied, is inserted through the jack for removing the cover or for locking it. Both wood screws and self-tapping screws are included in the kit for each box so that the base may be mounted on any type chair. A protective resistor within the box circuit prevents inter-

ference with other units in case of a "short" in any phone in use.

#### Protective Features, Simple Installation Setup

The equipment includes a high-quality bridging amplifier mounted in the projection room and connected into the theatre sound system. Direct operation from an a-c line and a separate volume control isolate the equipment so that its use has no effect upon the theatre sound system.

Installation is simple: conduit is run from the projection room into the auditorium floor to the selected seats. Condulets connect the armored cable from the jack box to the audio lines from the bridging amplifier in the projection room. The equipment is available in types for either air or bone conduction, with headband or lorgnette handle.

### 2 New 18-Inch Film Magazines by Wenzel Augment Line

Two new 18-inch projector magazines—the De Luxe and the Standard—have been announced by Wenzel Projector Co., Chicago. These new magazines are  $\frac{1}{4}$  inch deeper on the rear wall and provide practically  $9/16$  inch clearance between the reel and the wall. The shafts on both upper and lower magazines are  $\frac{1}{2}$  inch diameter through the length of the bearing surface.

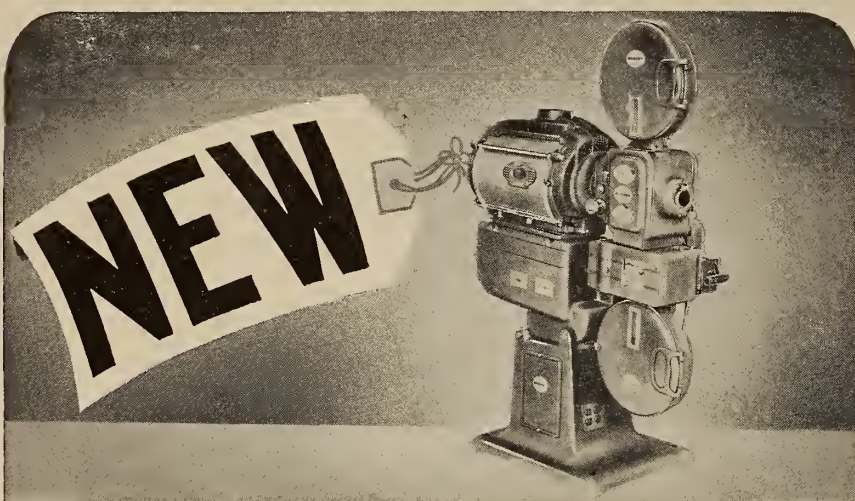
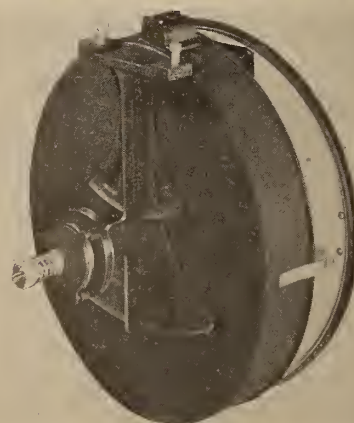
On the upper magazine, the part of the shaft which carries the tension adjustments will retain the present  $\frac{3}{8}$  inch diameter, since there are some reel-end alarms made to attach to this diameter shaft.

#### Oilite Bearings Reduce Maintenance

The upper magazine shaft runs in two flanged oilite bearings pressed in from each side of the magazine bracket, leaving a slight gap between the two inner ends of the bearings to serve as an oil reservoir. A dash of oil every few weeks is all the lubrication necessary.

Both ends of the bracket are recessed so

Wenzel de-luxe 18-inch magazine.



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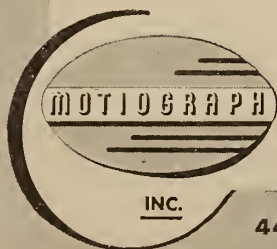
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the flange faces of the bearings, the steel collar on the reel shaft inside the magazine and the steel collar used in the tension spring are steel against oilite, thus barring any chance of uneven wear or freezing at these two points. The lower magazine shaft runs in a hardened and ground steel bearing. The bearing surface of the upper magazine is 2 7/16 inches long, that of the lower magazine 4 1/16 inches.

New aluminum brackets have been designed for these magazines, the extruded edges being highlighted. A new design door-opener has also been adopted, and the sash of the film window glass is nickel-polished. A new type positive-acting spring tension

### Record Kodak Wage Dividend

A record-breaking wage dividend of an estimated \$13 million for about 51,500 employees in the western hemisphere has been voted by Eastman Kodak Co. The wage dividend, largest total amount in the 37-year history of the plan at Kodak, will be paid next March. Eligible employees will receive \$22.50 for each \$1,000 earned during 1944 through 1948.

Last year the wage dividend totaled approximately \$11,600,000 for 49,300 employees.



A. J. SEXTON, JR.—General Manager, Sexton Theatre Company, Ashland, Kentucky—says:

"An RCA Service contract has proved to me the best investment any theatre owner could make for the finest engineering and mechanical upkeep of booth equipment. It is essential in any theatre."

To get the benefits of RCA Service—write: RCA SERVICE COMPANY, INC., Radio Corporation of America, Camden, New Jersey.

brake drag has been designed for both upper and lower magazines.

The present less expensive 18-inch upper and lower magazines still will be available. The present 18-inch magazines will be known as Pro-21 and Pro-22; the new magazines will be known as Pro-31 and Pro-32. Complete details are available from Wenzel Projector Co., 2505 S. State St., Chicago 16.

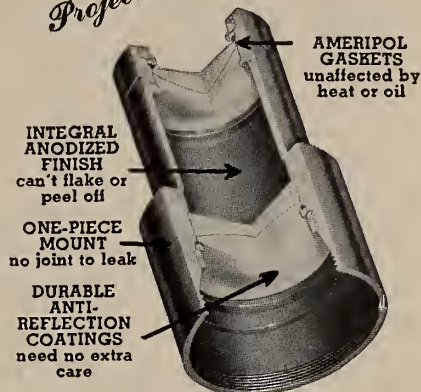
### IN THE SPOTLIGHT

(Continued from page 19)

vision jurisdiction in New York City . . . Roy Brewer, International representative, reelected president of the Hollywood Film Council . . . IA documentary film warmly received at Local Union showings throughout the Alliance . . . Bert Ryde, Buffalo Local 233, unanimously reelected business agent of the Local for an additional five-year term . . . Detroit Local 199 negotiated new two-year contracts calling for wage increases . . . Roy W. Wier, Minneapolis Local 13, elected to Congress on the Farmer-Labor ticket . . . Two-year contracts concluded between the IA and the Altec and RCA service companies give sound service engineers a weekly pay raise of \$10.40, plus increased automobile allowance . . . The death of Harry Petty, Louisville Local 163, stunned his many friends . . . Local 489, Kansas City, Kans., won court case instituted by apprentice member . . . Bill Covert, business representative for Toronto Local 173, reelected for another five years . . . Local 22, Washington, D. C. defeated charge of feather-bedding . . . New York Local 306 organized a 16-mm department under the direction of Charlie Kielhorn, executive board member . . . St. Louis Local 143 celebrated its 40th anniversary . . . New TMA (Theatrical Mutual Association) lodges formed throughout country; plans made for 1949 national convention in N. Y. City.

One of the most encouraging aspects of the past year's happenings was the resumption of the close relationship which existed between equipment manufacturers and projectionists in pre-war years. The numerous lectures and demonstrations sponsored by manufacturers

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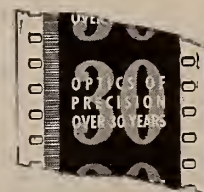
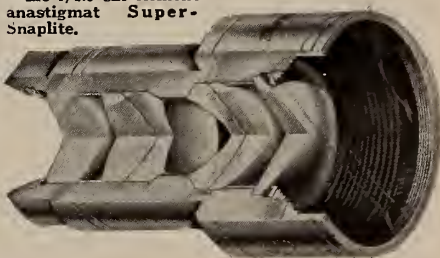
### All Aluminum Construction

Each Snaplite lens is distinguished by its sleek black aluminum mounting. The black anodized finish is an integral part of the aluminum—can't chip, flake, or peel off.

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For brighter . . . sharper . . . clearer pictures, use f/2.0 Snaplites or f/1.9 Super-Snaplites in your projectors! Full details of all Snaplite lenses are given in Bulletin 204, available from your local supply dealer.

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for projectionist groups, involving no little effort and expense, points to an abandonment of the aloof attitude displayed by manufacturers during the war years. It is all to the good and will help both manufacturers and the craft by improving equipment and technique.

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### Novel 'Wiring' With Silver Ink

Engineers have solved the problem of making a new-type hearing aid as compact as a lady's cigarette case by "wiring it with silver ink." Silver is the best metallic conductor of electricity, however minute the portions. Hence it has been found possible to "draw" the intricate and minute wiring system of the hearing device on a thin "instrument board" of ceramic material about as big as the top of a box of safety matches.

Application of heat to the silver ink bonds it to the board, and at just-right spots resistors, condensers and tubes fit into place. Midget batteries and microphone complete the compact assembly. "Silver ink" is said to replace 173 tiny items that are necessary in the standard wiring system of a hearing aid device.

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### FLICKER IN MOTION PICTURES

(Continued from page 17)

tional series inductance. The increased series impedance offers a further advantage in that the arc stability is improved.

Independently, engineers involved in the frequency conversion to 60 cycles in the Southern California area discovered the same trouble when flicker appeared in theatres after the 50- to 60-cycle change. The inductance design has been supplied them and, to date, five theatres have been equipped. Reported results state that the improvement amounts to 75 to 90% elimination of visible flicker due to this source.

To forestall serious arc flicker, main-

tenance men have been supplied with a ripple meter which is arranged principally to measure 60-cycle components.

### Conclusions and Recommendations

After discussing flicker sources in production, the Grignon paper offers the following conclusions and recommendations:

(1) Steady technical improvement in illumination level and theatre presentation has reached the point where future attention must be directed toward improving mechanical motions and provid-

ing better auxiliary apparatus and materials to minimize flicker and/or allow greater latitude in usage before flicker becomes apparent. Nearly all elements in the basic technical motion picture production and exhibition system have insufficient margin for flicker-free films.

### Over-all Permissible Variation

(2) The sum total of all variations in the system which produce flicker should not exceed 2%. However, 3% variations may be temporarily acceptable.

(3) Analytic examination of film processing and incident or reflected light

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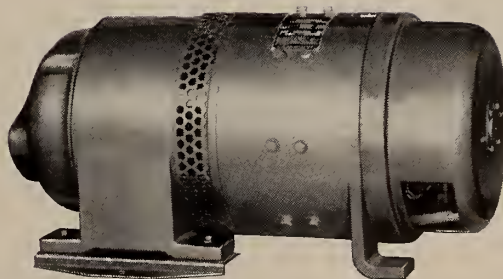
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(with projector running) of a theatre screen is involved and difficult. Mechanical motions can be best studied by measurement of instantaneous velocity.

(4) Symmetrical two-bladed projection shutters producing a 48-cycle rate are presently acceptable but may require revision if illumination is increased appreciably.

(5) Arc-supply apparatus should not contain more than 0.15% of 60-cycle components for usual line-supply conditions and practical limits of equipment aging. Series inductance is desirable for filtering to meet these requirements and further stabilizes arc burning. Arc-supply ripple should be measured periodically to indicate proper operation and forestall serious flicker from this source.

(6) Film stock has introduced flicker but such cases are apparently random in nature.

#### **Damping, Filtering Shutters**

(7) Nonuniform shutter velocities, either camera or projector, cause flicker. Variations up to 7%, peak to peak, have been measured and reproduced for analysis. Shutters should be damped or filtered. Consequently, future work should be directed along this line.

(8) Conventionally controlled camera motors should be supplied for the great-

est practical pull-out power. This includes synchronous motors controlled by line frequency.

(9) In so far as possible, flexible couplings having torsional compliance should be avoided but if this is impractical or impossible, suitable damping must be provided. Flexible couplings used for angled drives introduce non-uniform motion in the driven member. Therefore, this type of mechanism must be avoided.

(10) All film propelling or handling mechanisms must be kept free of small periodic bindings, tight spots, or other irregularities. This rigid requirement can be lessened if filtered shutters are provided.

(11) Work should be initiated to investigate the effects of periodic supply variation on photographic illuminants and the flicker resulting therefrom.

#### **Periodic Brightness Differences**

(12) A study should be made to provide accurate data on periodic perceptible brightness differences as a function of brightness, frequency, and surroundings. This could be done by a university or medical school, but since the information is peculiarly applicable to motion pictures, it may be that the SMPE should undertake such a program.

Undoubtedly, in the foregoing material

it has been noticed that many branches of this subject have not been explored and others only superficially examined. This is an indication of the amount of work still to be done and emphasizes the need for broadened and accelerated activity in this problem of motion picture production and presentation.

## **HISTORICAL SKETCH OF TV**

*(Continued from page 11)*

tem for the transmitter. Sutton's apparatus used a scanning disk and a light source controlled by a Kerr cell. This method of reassembling the image was likewise remarkable in that it was used widely in practical Tv systems for nearly 40 years.

At the turn of the century, Sir J. J. Thompson, in his work to determine the charge-to-mass ratio of the electron, showed that the cathode ray was in reality a beam of high-speed electrons. His methods involved the application of both electric and magnetic deflecting forces. At about the same time, Professor Braun built a cold-cathode-ray tube. With it he could show the effect of magnetism on electron beams in tracing their paths on a fluorescent screen. From the viewpoint of Tv, this was to

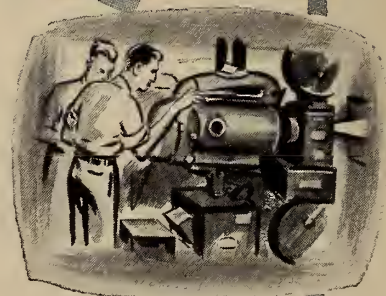


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Successful theatre operators constantly seek perfection in projection. They know that profits are dependent on projecting sharp, uniformly brilliant screen images. That is why the overwhelming majority of new theatres shown in the current Theatre Catalog were equipped with Bausch & Lomb projection lenses. Perfection in projection will be the standard in your theatres, too, if you use Bausch & Lomb lenses. Bausch & Lomb Optical Co., 616-A St. Paul St., Rochester 2, N. Y.

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be the means of scanning control for Crookes' cathode rays. Amplitude control, on the other hand, was to come later.

### Swinton's Basic Conception

By the end of the first decade of the 20th century, Professor Boris Rosing had patented a Tv system, using a receiver resembling the modern set, based on the Braun cathode-ray tube. In 1911, A. A. Campbell Swinton, a man of great imagination and foresight, saw the possibility of Tv communication with variations of Rosing's cathode-ray tubes at both transmitter and receiver. Recent years have shown that Swinton actually predicted Tv apparatus as used today, having developed the theory of a cathode-ray-tube camera. Meanwhile, Knudson had sent the first drawing by radio.

Only a few of the early discoveries and inventions are directly employed in modern Tv. However, the original work and inventions gave impetus to experiments in demonstrating that light could be converted into electrical impulses which, in turn, could be transmitted and later reconverted. Fortunately for Tv, the development of the radio and electrical arts coincided with the advanced phases of research in the fields of optics and vision.

### Zworykin, Baird Contributions

World War I delayed progress universally, for the next important date is 1923 when Zworykin filed patent application on the first electronic Tv camera tube, the Iconoscope, wherein the means for scanning control, as well as for pic-

ture signal-amplitude control, were all self-contained on a completely electronic basis. While the idea had been proposed early in the art, this was the first practical means of achieving it.

At this time J. L. Baird in England, and C. Francis Jenkins in the United States, working independently, produced and demonstrated Tv systems based on mechanical scanning through the use of the Nipkow disk or something similar to it. The disk carried holes along a spiral in such a way that a scene, when viewed through a portion of it, would be broken into parallel lines or arcs, thereby providing the means of measuring light values along the short time-base which represented the frame interval. The pictures were mere shadowgraphs at first, but Baird soon demonstrated Tv transmission of half-tone pictures as well as infrared Tv.

This method of scanning, having serious limitations in definition, is not in use today, nor is the receiving system that reconstructed the picture by reversing the process. While the low-definition (less than 60-line) images of those days may seem to have little bearing on techniques which produce present-day, continuous-tone pictures in a 525-line system, much of the theory which makes present equipment possible was proved during this mechanical era.

### Wire, Radio Links in 1927

In 1927 the Bell System demonstrated the transmission of Tv over substantial distances; between Washington and New York over wire line, and between Whippany, N. J., and New York over radio link. With this was published an analysis, thorough for the time, of the

transmission problems facing Tv, particularly the frequency bandwidth requirements which have become so characteristic of the art.

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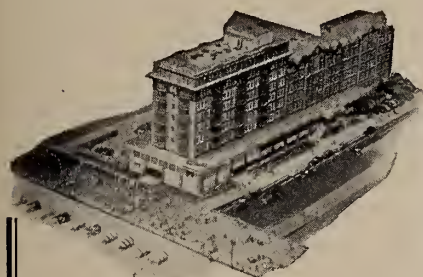
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many developments in steady succession. These began with the National Broadcasting Co.'s first radio network and Warner Brothers' "Vitaphone" sound-on-disk system synchronized with motion pictures. Concurrently, Congress established the Federal Radio Commission; progress continued with Bairds' first trans-Atlantic Tv picture and his first crude systems of color and stereoscopic Tv; Farnsworth's system and Zworykin's system of all-electronic television were



E. J. HALEY—President, Booker T Theatres, Raleigh, North Carolina—writes:

"Sound service is one of the vital functions of successful theatre operation. We have found RCA Service to be competent and responsible in supplying this need."

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introduced employing special cathode-ray receiver tubes called kinescopes; Bell Laboratories demonstrated Tv in color, delivering a picture of postage-stamp size; theater Tv was shown on screens as wide as 10 feet; two-way-wire Tv-telephone demonstrations were made by Bell; improved photoelectric cells and electronic tubes were introduced; an extensive program of field tests by RCA was initiated starting with 240-line all-electronic television employing radio relay, to continue right through the period of commercial operation: and, finally, the 1935 announcement of the principle of frequency modulation by Edwin Armstrong.

Through the efforts of men like Zworykin, Engstrom, and Goldsmith of RCA; Farnsworth; Ives and others at American Telephone and Telegraph Co.; Alexanderson of General Electric; Dumont; and Goldmark of Columbia Broadcasting, well-planned and well-executed programs made public participation in the U. S. A. possible in 1934.

#### Coaxial Cable Introduced, 1936

The Philips Co. of Holland built the first iconoscope in Europe in 1935. Tv transmitters appeared in places such as the Eiffel Tower and Stockholm. As the advance continued, A. T. and T. successfully demonstrated the capabilities of coaxial cables in 1936. Such cables were laid from New York to Philadelphia, from Paris to Bordeaux, and from Berlin to Nuremberg. The first patent on coaxial cable was granted in England at this time, and cables were laid from the British Broadcasting Corp. trans-

mitter to Buckingham Palace and Victoria Station for the first direct televising of coronation-procession street scenes.

In 1938 Tv signals from London, on ultra-short waves, were picked up on Long Island, although badly distorted.

The point was reached wherein one saw the telecasting of plays from theater stages, the New York World's Fair, major-league baseball, and professional football. Meanwhile RCA introduced an improved Tv camera tube, the Orthicon. It is beyond the scope of this paper to enumerate the many developments from that point to date.

The lack of uniformity in choice of number of lines for the picture structure was never satisfactory to the non-technical observer who was quick to compare Tv with motion pictures. Because of this, and in keeping with the steady advances, "definition" was standardized at 343 lines in 1935. Later this was raised to 441. In 1940 it was increased to 525, where it remains as today's standard.

Although World War II brought an apparent period of inactivity, an abundance of knowledge and technical personnel grew out of government-sponsored radar and guided-missile programs. Accelerated research and development produced items such as the high-sensitivity image-orthicon and phosphors to withstand the bombardment of highly accelerated electron beams, for brighter pictures.


#### Color vs. Monochrome Controversy

The highly controversial issue of color versus black-and-white Tv brought the industry to a virtual standstill. After this was settled early in 1947 in favor of black-and-white, the prospective broadcaster, the equipment manufacturer, and the receiving-set purchaser appeared ready to invest in the fast-growing business.

By December 31, 1947, the score totaled 12 cities with Tv service; 18 stations operating and 55 licensees; 287 sponsors; 142,400 receivers in private homes; 27,600 receivers in public places; 195,000 total receiver production; and an estimated audience of 1,200,000, with assurance of nation-wide networks in the reasonably near future.

[NOTE: Today there are 50 Tv stations on the air spotted in 32 cities through 25 states, with an audience of about 40 million viewers within range of more than a million receivers.

It is estimated that during 1949 another 1,600,000 Tv receivers will be in use, while 123 stations will be broadcasting in 70 cities through 35 states. In 1953, Tv people assert, there will be 17 million receiving sets for an audience of 60 million people.—Ed.]



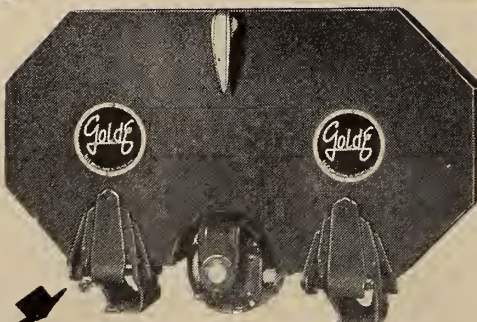
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Will Not Clinch Film

**Modern, Compact Design**

**"Tilt-back" Case . . .**  
Reels Can't Fly Off

## SOUND SYSTEM ELEMENTS

(Continued from page 8)

arate voltmeter and ammeter readings) gives the power factor:

$$\cos \phi = \frac{\text{True watts}}{\text{Volts} \times \text{Amperes}}$$

In actual practice the optimum power factor of 1 is seldom attained. The power factor of city feeder circuits normally ranges from 0.8 to 0.9.

### Effects of Capacitance

Capacitance also throws current and e.m.f. out of phase, reducing the power factor and tending toward wattless current. When a condenser is supplied with a-c, the current-peaks lead the voltage peaks. Curve C in Fig 2 shows a 90-degree current lead. Although this condition is never attained in practice, it may be approached very closely in a circuit containing a large capacitance.

A condenser acquires a charge while the supplied voltage is rising, and loses its charge while the supplied voltage is falling. During the charge period the current-flow is in the same direction as the voltage, but during the discharge period—which begins at a voltage-peak—the current-flow from the condenser is opposite in direction to the supplied e.m.f. Hence, the current changes are said to lead the voltage changes in a purely capacitive circuit by 90 degrees.

It is easy to see that, even though current does not actually flow *through* a condenser, the surge of electrons *in and out* of the plates results in an alternating flow in the circuit. But because a condenser returns very nearly as much power to the circuit as it takes, the net power consumption is 0.

Inductances and capacitances may be thought of as devices which oppose changes of current. Both may be used to absorb surges of current and to "fill in" sudden drops. An inductance is the electrical equivalent of a flywheel, and a capacitance is the electrical analog of a spring.

### Reactance

The effect of inductance and capacitance in a-c circuits goes by the name *reactance*. There are, accordingly, two kinds of reactance; *inductive reactance* and *capacitive reactance*. Because reactance presents an opposition to current-flow it may, like resistance, be meas-

ured in ohms. But whereas the flow-opposition of pure resistance consumes power (watts), reactances return power to the circuit, and therefore use up no power—theoretically, at least.

Pure resistance functions in a-c circuits in the same way as in d-c circuits; hence we use Ohm's law formulas for calculating it:

$$R = \frac{E}{I}$$

Curve A of Fig. 2 shows voltage and current in the co-phasal relation, a condition which obtains perfectly in a purely resistive circuit.

The reactance of an inductor or capacitor, unlike the resistance of a resistor, varies with the frequency of the current, making the calculations more complex. Inductive reactance in ohms,  $X_L$ , is given by the following formula in which  $f$  is the frequency of the current and  $L$

is the inductance in henries:

$$X_L = 2 \pi f L$$

while the ohmic value of capacitive reactance,  $X_C$ , is given by:

$$X_C = \frac{1}{2 \pi f C}$$

in which  $C$  is the capacity in farads. When using these formulas, millihenries, microhenries, etc., should be converted to henries, and microfarads, micromicrofarads, etc., to farads.

When several inductors or capacitors occur in a circuit in series or parallel, it is advisable to calculate the resultant inductance or capacitance before computing the inductive or capacitive reactance. Herewith are the formulas for these calculations.

Inductors in series:

$$L = l_1 + l_2 + l_3 + \dots$$

Inductors in parallel:

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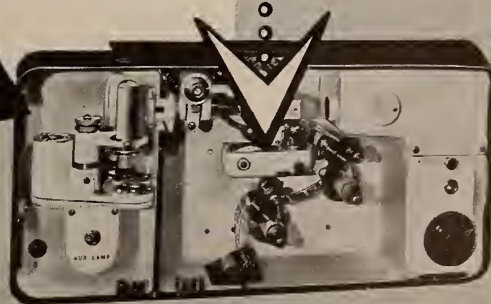
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$$L = \frac{1}{\frac{1}{l_1} + \frac{1}{l_2} + \frac{1}{l_3} + \dots}$$

Capacitors in series:

$$C = \frac{1}{\frac{1}{c_1} + \frac{1}{c_2} + \frac{1}{c_3} + \dots}$$

Capacitors in parallel:

$$C = c_1 + c_2 + c_3 + \dots$$

### Net Reactance

Net reactance,  $X$ , signifies the resultant reactance of two or more reactances—inductive, capacitive, or both. In all cases where several reactances of the same kind (either inductive or capacitive, *not both*) are connected in series, the total reactance is:

$$X = x_1 + x_2 + x_3 + \dots$$

but if the "like" reactances are connected in parallel, the net is given by the following:

$$X = \frac{1}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \dots}$$

You will recall similar formulas for resistances in series and parallel.

Now if two groups of reactances, one inductive and the other capacitive, be connected in series, the net reactance is obtained by subtracting the lesser reactance from the greater. (In the following formula it is assumed that the inductive reactance is numerically the greater):

$$X = Xl - Xc$$

When a circuit consists of pure reactance (reactance without resistance), we may find the ohmic value of the reactance by substituting  $X$  for  $R$  in the familiar Ohm's law formula:

$$X = \frac{E}{I}$$

Consequently, voltage and current in a reactive circuit are given by:

$$E = IX \text{ and } I = \frac{E}{X}$$

### Total Impedance

Because of the fact that pure resistance is ordinarily found in a-c circuits in conjunction with reactance, formulas for total impedance are especially useful in sound-system work. Impedance,  $Z$ , signifies the combined current-impeding effects of resistance and both kinds of reactance, and is also measured in ohms.

If the effective voltage and amperage in a series circuit are known, impedance



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is given by substituting  $Z$  for  $R$  in Ohm's formula:

$$Z = \frac{E}{I}$$

It follows that voltage and current in an alternating-current circuit may be found by transforming this equation into the following two forms.

$$E = IZ \quad I = \frac{E}{Z}$$

When we know the ohms of resistance

and the ohms of net reactance in a series circuit, impedance may be calculated by:

$$Z = \sqrt{R^2 + X^2}$$

in which  $X^2$  equals  $(Xl - Xc)^2$ .

Calculating the total impedance of resistances and reactances in parallel arrangements poses a slightly more difficult problem. Here is the easiest way to do it.

We shall assume that the resistive and reactive branch circuits each receive the same voltage, so we first calculate the amperes flowing in each branch:

Resistive:	Inductive:	Capacitive:
$I_R = \frac{E}{R}$	$I_{Xl} = \frac{E}{Xl}$	$I_{Xc} = \frac{E}{Xc}$

We next combine the reactive currents, subtracting the smaller from the greater:

$$I_X = I_{Xl} - I_{Xc}$$

and the values of  $I_R$  and  $I_X$  are then used in the following final formula which gives the total impedance in ohms:

$$Z = \frac{E}{\sqrt{I_R^2 + I_X^2}}$$

An appreciation of these formulas and of the electrical quantities involved therein will provide a sufficiently good understanding of alternating currents to enable us to proceed directly to an examination of amplifier circuit-coupling methods.

[To be Continued]

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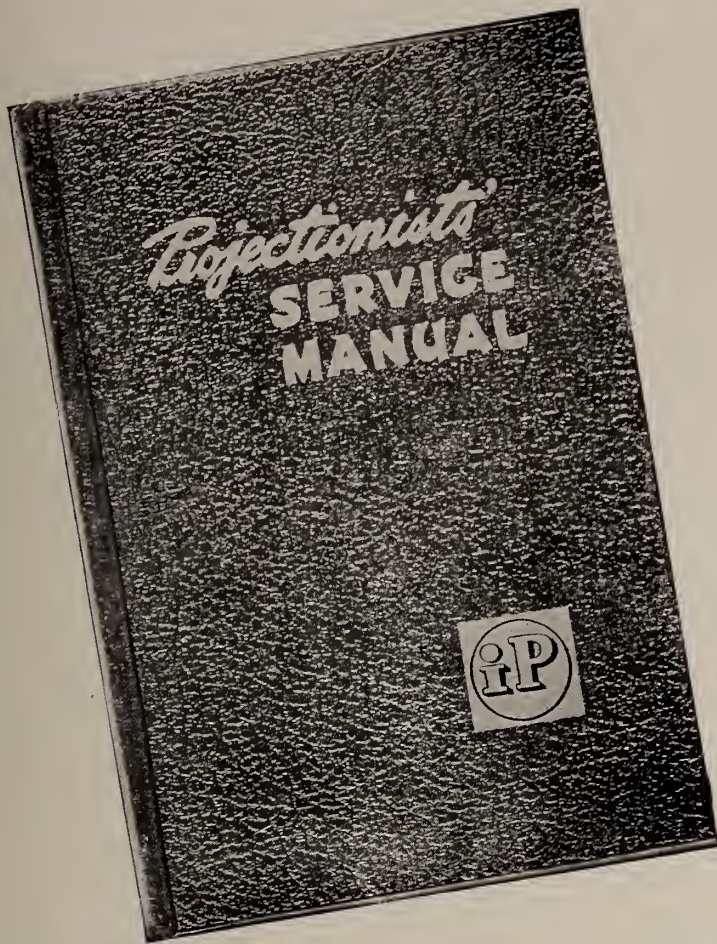
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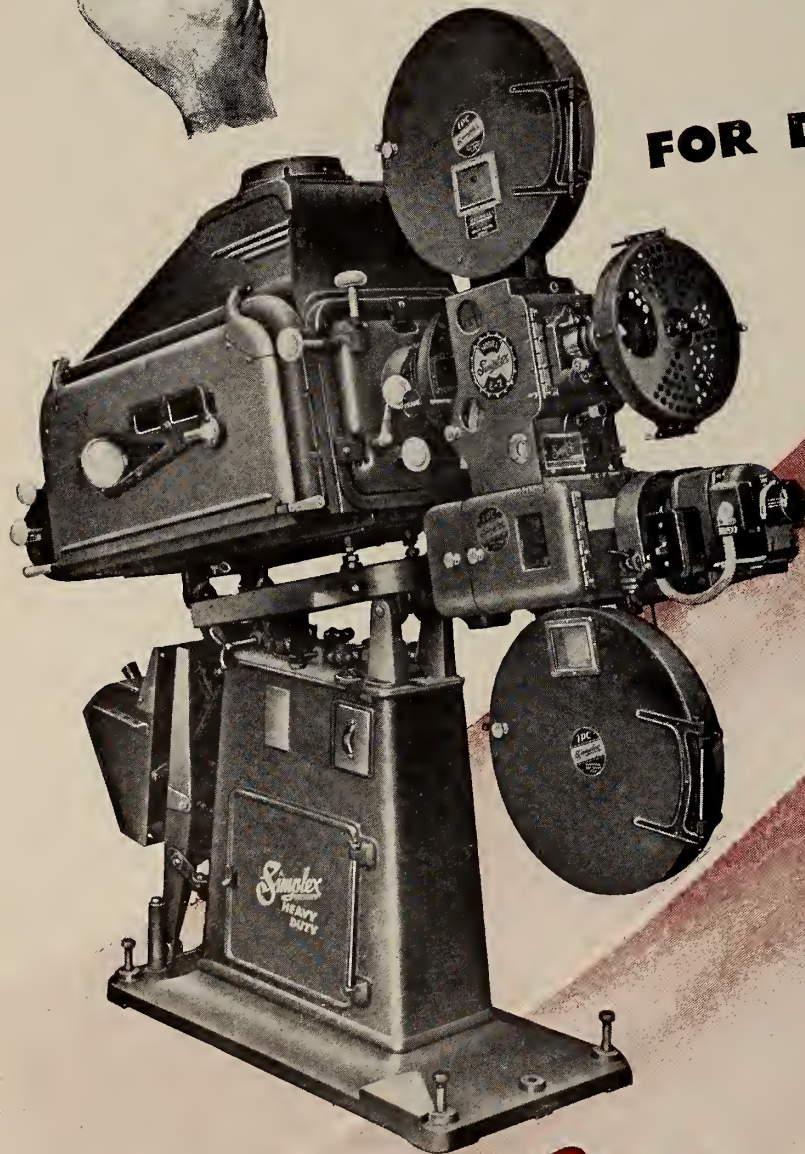
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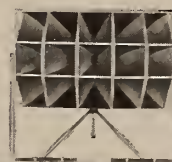
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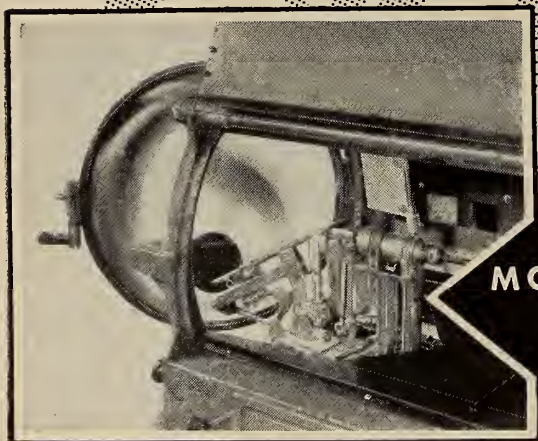
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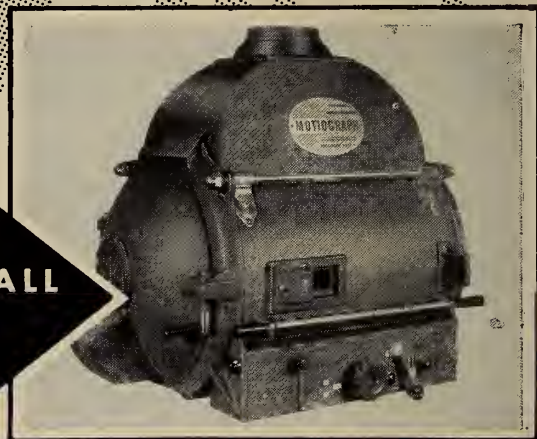
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HENRY B. SELLWOOD, *Editor*

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FEBRUARY 1949

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## MONTHLY CHAT

IP HAS always approved and even encouraged the most extensive field-testing of equipment intended for general use in theatre projection rooms, experience having demonstrated that even the most intensive laboratory or in-factory testing not infrequently fails to disclose operating deficiencies which manifest themselves when once the unit is operated in the field.

IP is almost invariably privy to such testing operations, whether in the factory or out in the field, and it has never knowingly abused the confidence of any manufacturer with respect to these proceedings. Of late, however, there has developed a tendency on the part of certain manufacturers to effect the transition of a given unit from the "experimental" to the commercial stages under a blanket of secrecy which is hardly flattering to the unit involved. The first intimation that IP has that such units are available is when its readers write in to inquire about certain characteristics of the equipment.

Now, IP's function is obviously that of disseminating information as speedily and in such detail as will gain and hold the interest of its readers. It is certainly not to IP's benefit—nor to the benefit of the craft in the long run—for various units to be slipped into circulation in a manner that approaches the surreptitious. All too often has IP first learned of the commercial status of a hitherto "experimental" carbon trim, or a lamp, or other projection unit *via* a series of letters from projectionists in the area selected by the manufacturer as a point of penetration.

Then unfolds the all too familiar pattern: some months later there descends upon IP a packet containing reams of copy and a sheath of glossy prints the "generous" use of which is requested by the manufacturer of this "new" equipment. This after IP's people have been using the equipment for many weeks and, likely as not, a detailed exposition of the unit has been made before an "engineering" society among the members of which there are few, if any, "live" customers.

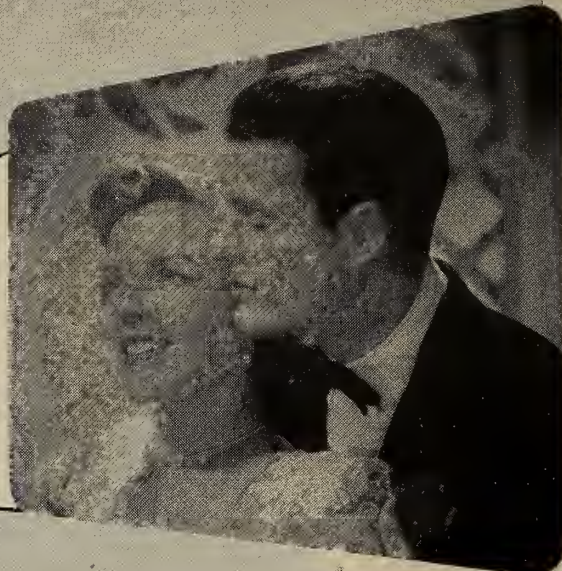
Such a procedure adds up in IP's offices to a lot of malarkey, a sort of editorial stew that IP cannot and will not longer digest. IP considers it necessary to offer its own definition of the word "experimental," as follows:

That unit may be considered to be in the "experimental" stage which has not yet been offered for sale. The moment a given unit is offered for sale it becomes a "commercial" item and as such will be subjected to appraisal by IP, with or without the manufacturer's assent. This definition presages a bit of rough going for some of the "cute" manufacturers, but their discomfiture will not alter one whit IP's determination to serve its own best interests by serving its readers best.

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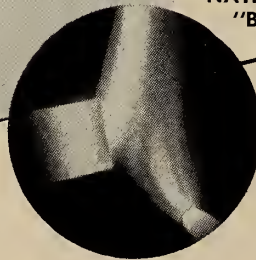
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## Coated Lenses: Nature and Care

By A. E. MURRAY

Scientific Bureau

Bausch & Lomb Optical Company

**T**HERE seems to be an elfish, mischievous, almost malicious spirit about modern technology: we no sooner adapt ourselves to an innovation, learning its idiosyncracies, its own peculiar little laws the better to pay it its due respect and to gather from it all it can give, than another comes along with its own set of eccentricities which on the basis of chance cannot be identical with those already painfully learned, and the whole wasteful process of learning by error must be started afresh.

Just such a development apparently has been witnessed in the field of optics within the past ten years with the introduction of coated lenses. The care of high-grade lenses, learned through countless mistakes, was fairly well understood, to judge from the reports received by the manufacturers, until the whole field was turned topsy-turvy by the development on a commercial scale of the techniques of applying anti-reflection films.

### *Lens Mistreatment Widespread*

The manufacturer now receives lenses showing indisputable evidence of mistreatment, the result of either ignorance or sheer carelessness which, for the most part, seems inexcusable. He is somewhat more than a bit perturbed to see these lenses in such a condition, for aside from a natural pride in a well-made product, repairs cannot in the long run be profitable, for they are at best stop-gap and the manufacturer's reputation inevitably suffers.

It is to alleviate some of these troubles that this article was prepared, and it is

hoped that those who handle the really excellent lenses of today will gather from it a better understanding of the physical nature of that extremely thin boundary between air and glass which has such a profound effect on the optical properties of the objective elements.

The extent to which most optical glass is delicate—and therefore subject to scratching by an astonishing array of things we have learned to think of as truly soft—is not realized except by those who have seen the effect of common dust rubbed over a polished optical glass sur-

face. Once seen, such a demonstration cannot be forgotten.

The accompanying illustrations are photomicrographs of emery grains and common dust—not, however, to the same scale. The first-named substance is used to grind curves on lenses; its abrasive qualities are commonly known. The second produces scratches in fine optics, its multitude of sharp edges being hint enough of the hazard in indiscriminate rubbing over a dust-laden polished surface.

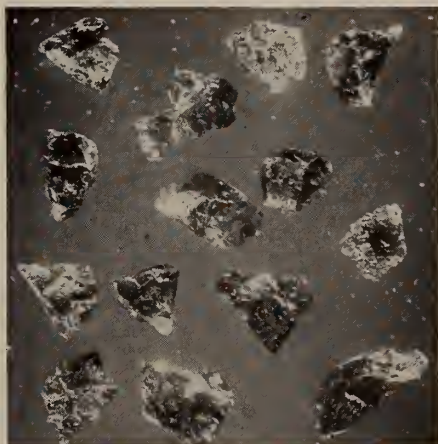
### *Even Bland Substances Unsatisfactory*

Even such a bland substance as face powder is capable of producing scratches sufficient to destroy the fine polish laboriously applied at the factory. Individually, such scratches exert a negligible effect, but multiplied many times over so as to cover the entire lens surface, they can be disastrous to good imagery and contrast on the screen.

All cleaning powders contain such abrasive matter, despite assertions that they never scratch, and are thus *never* to be used to clean a lens, coated or uncoated. This homely little principle seems to be well enough understood by the majority of projectionists and photographers.

The introduction of filmed optics has not changed substantially the recommended cleaning practices, but it has brought with it a new factor in the increased sensibility of the filmed surface to contamination of any kind.

The surface reflectances of most substances likely to be found spread on a



Coarse emery particles at 12x magnification. These sharp particles are used in grinding lenses.

lens approach that of the glass itself and thus would not be easy to see against the surfaces. A thin uniform layer of water is totally unrecognizable against glass until it loses its uniformity, *i.e.*, begins to evaporate or to flow off, when the varying thickness betrays it.

### Coated Surfaces More Demanding

The story is totally different with coated surfaces. The reflectance here is so low that a drop of liquid of any kind, oil or water, is instantly manifest as a grossly different area, a horrid spot quite out of keeping with the rest of the surface, a disfiguring area that demands removal because of its heretical reflectance.

Coated surfaces are no more difficult to clean than the unfilmed ones: the penalty of incomplete or careless cleaning is simply more evident. Exactly the same amount of elbow grease, properly applied, is required to make an unfilmed surface clean as to perform the same duty for a coated one—the only difference being that with the latter the residue likely to be overlooked in the uncoated lenses just cannot be tolerated, since it will obtrude itself painfully.

Moreover, the filmed surface, or the substance applied to produce the anti-reflection properties, demands the same careful treatment as does the original glass surface. In fact, the magnesium fluoride commonly applied has a chemical inertness exceeding that of many of the optical glasses. It thus can stand attack by stronger chemical cleaning agents than, in many cases, the glass itself.

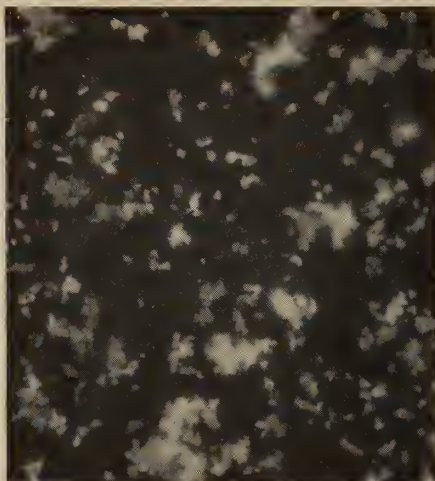
But this circumstance is slight consolation indeed, for no strong agents can be used in the cleaning process because of the other substances used in making lenses—the metal mounts, the optical cements, and even the lacquer used to cut down reflections.

### Coatings Hard But Thin

Similarly, the hard coatings in their mechanical properties are as scratch-resistant as most optical glasses. This statement, while true in itself, is woefully misleading. The coating may be as hard but it cannot be as thick; and as we have already seen that glass itself is soft, the coating may be destroyed surprisingly easily by abrasion, which, of course, means the loss of anti-reflecting properties.

The net consequence of all this is that coated surfaces should be treated with the same degree of gentleness as is glass. Under no circumstances are abrasives to come into contact with lenses, coated or uncoated: their effect is no greater on the one than on the other, but is simply more readily recognized in the filmed surfaces.

Investigation at Bausch & Lomb has



Dust of unknown origin at 100x magnification. The hazard involved in rubbing this air-borne dust over highly polished surfaces is obvious.

shown that the best cleaning agents for lens surfaces, both filmed and unfilmed, are: (1) a gentle blast of air; (2) a camel's hair brush; (3) a soft cloth properly used; (4) the film of moisture from the breath together with a soft cloth; (5) warm, *not hot*, pure or distilled water; (6) most of the common detergents (the commercial "soapless soaps" such as women use for sheer lingerie), and (7) warm water suds of the mildest soaps such as are suitable for babies.

The use of any of these agents should be followed by rinsing in pure warm water.

### Solvents Strictly a Last Resort

When all else fails, and strictly as a last resort, one is confronted with the use of solvents such as alcohol—and even at this point solvents should be used *very sparingly*.

The use of alcohol is the most drastic treatment to which lenses can be subjected and is always attended by considerable danger. A manufacturer just cannot recommend solvents for the cleaning of his lenses, even in the most skillful hands, and he is fully justified in refus-

---

## LENS CLEANING RULES

1. Remove dust. (Blow, brush or wipe off.)
2. Clean with water, detergent solution, or mild soap. Rinse scum-free.
3. Always use dust-free cloths, cotton, or lens tissues.
4. Never use cleaning powders.

---

Post These Rules for Ready Reference

ing responsibility for any damage resulting therefrom.

The techniques discussed in the remainder of this article, familiar in their broad outlines to the reader, will have their emphasis on the reason *why* rather than the *what*.

The very important first step, without which all that follows is unavailing, is the removal of every particle of dust from the lens surfaces. If this is not done, serious consequences are likely to ensue; moreover, in a majority of cases this is all the treatment necessary to restore a dirty lens to its original efficiency. But the removal process requires extreme care if it in itself is not to produce marks.

### Efficient Cleaning Procedure

The most efficient manner of cleaning a lens is to blow the dust off, using a syringe, or even the breath. If dust particles still linger, as is likely, particularly if one attempts to blow it away, a soft camel's hair brush will pick up what remains. The brush should be tapped on the edge of the table after each pass in order to shake out the grit and dust particles picked up from the lens surface.

It is also possible to remove this dust by the use of a cloth wrapped about the finger. The cloth must be very soft, recently laundered and scrupulously clean, if it is not to introduce its own dust and, what is more annoying, lint. An alternative choice is lens tissue, available at camera stores.

The trick is to wipe across the surface gently by rotating the finger and the cloth so as to pick up the dust and remove it from the contact point. If the motion is across the glass surface from right-to-left, the cloth-wrapped finger should be rotated clockwise; for left-handed people, counter-clockwise rotation is indicated.

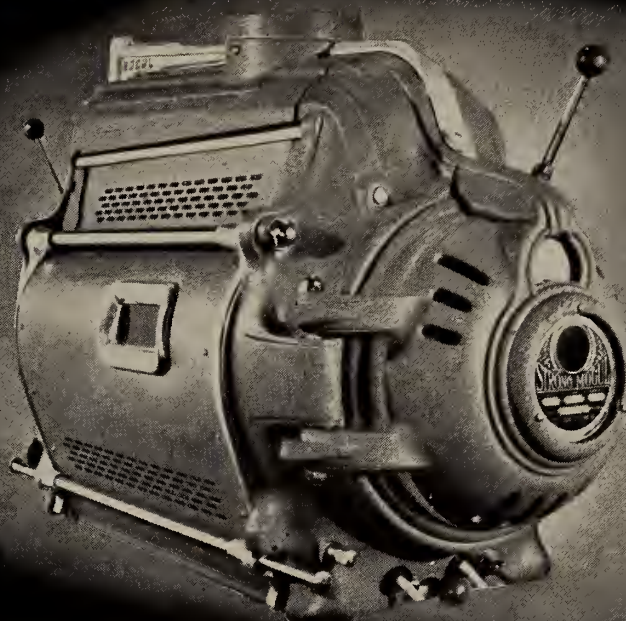
Once the dust is removed, the procedure is straightforward. It will be found that usually the film of moisture deposited by breathing gently on the lens, when removed by careful rubbing, will take with it the remainder of the scum and dirt.

If this does not suffice, it may be necessary to try heavier doses of water applied to the affected areas by a cloth wrung nearly dry, or by small pieces of surgical cotton wrapped on a toothpick or suitable stick, followed by a piece of dry cotton or cloth to remove the excess water and to dry the surface.

### The Use of Detergents

If water itself does not do the trick, resort to stronger agents is indicated. The very best of these is some common detergent dissolved in clean warm water in the proportions of one tablespoonful to the gallon. If this fails, the next strongest agent, and the last that can be

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recommended, is copious suds of a gentle soap. The use of these agents should always be followed by a thorough rinse with clean water, preferably lukewarm, and drying as aforementioned. By "rinse" is understood the application of clean water on a nearly dry cloth or cotton-wrapped stick or toothpick; it does not mean to *flush* with water.

No commercial cleaning fluid is recommended by Bausch & Lomb for the cleaning of high-grade lenses because they all are in essence the same solution, as described in the preceding paragraph. There is no point in paying for a product which is 99% water. One can make his own lens cleaning solution which, while it may not bear a fancy label and a specious guarantee, will be no less effective in removing dirt.

### Emergency Cleaning Methods

There may be especially obstinate cases when more vigorous methods are required, as when a lens has fallen into a barrel of oil, been splashed with paint, or been smeared with tar or some other equally stubborn substance. When these rare cases arise, such solvents as alcohol, carbon tetrachloride, lighter fluid, or the finest laboratory petroleum distillates may be used with the understanding that they entail considerable potentiality of damage to both the lens and its mount.

These solvents must be used extremely sparingly, never with enough to wet the cotton or cloth applicator, for the excess is likely to find its way into the interior of the lens, there to attack the cement and induce rapid deterioration. Another danger in the excessive use of solvents is the immanent possibility of irreparable damage to the seal. Of course, such liquids cannot be kept from the mount, where they attack the lacquer and reveal the bare metal, thus increasing the contrast-robbing light scatter.

Always after using these solvents the lens should be carefully cleaned with mild soap and water to remove the last trace of scum which remains after drying and which is particularly obnoxious on coated surfaces. It must be said again that these heroic measures cannot have the sanction of the manufacturer and he will assume no responsibility therefor.

### Approved Methods Apply Generally

The cleaning methods described herein are based on long experience and constitute the best techniques for the care of lenses. No distinction need be made between the present-day coated lenses and those few without anti-reflection films still in service.

Some of the very early lenses had an extremely soft coating which would bear no cleaning, rubbing off easily with a handkerchief: these were coated principally on the interior surfaces which were safe from damage. The coatings now ap-

## The Mechanism of Hearing

**M**OST people are perfectly content with the knowledge that they can hear the myriad and diverse sounds which go to make up a sound pattern which impinges upon their consciousness, but very few know or seem to care much about the manner in which this process is accomplished nor about the remarkable human mechanism which permits auditory perception—the ear.

A schematic cross-section of the human ear—and, as is customary, a distinction is made between the external, middle and internal ear—is shown in Fig. 1. The auditory organ proper is the inner ear, more specifically the cochlea, a canal of helical form embedded in the petrous part of the temporal bone.

Midway across this canal is a thin membrane, the so-called basilar membrane, along which the end organs of the auditory nerve terminate. The two canal halves thus formed are filled with liquid. They are interconnected at the far end of the cochlea by a small aperture, the helicotrema.

In Fig. 1 the cochlea is shown unfurled for clarity, and for simplicity no reference is made to the cochlear duct and associated organs.

### Transmission, Pressure Equalization

At the other end of the cochlea there are two apertures, one on each side of the basilar membrane. The lowermost, the round window, is closed by a membrane, whereas the other, the oval window, accommodates the footplate of the stirrup, the final link in the ossicular chain.

This chain, consisting of hammer, anvil and stirrup, transmits vibrations of the tympanic membrane to the liquid filling the cochlea. The Eustachian tube provides equalization of steady pressure between the two sides of the ear drum. The vestibular apparatus, also shown

schematically in Fig. 1, acts as the organ of equilibrium by utilizing the three semicircular canals which are oriented in three approximately orthogonal planes.

When the ear is exposed to sound of a given frequency, the sound pressure in the auditory canal activates the eardrum whose vibrations are transmitted through the ossicles to the cochlea. Wave motion is set up in the liquid of the cochlea in such a way that the deflections on the basilar membrane are localized in a certain area.

### Effect of Increased Stimulus

For higher frequency sound the area of maximum deflection on the basilar membrane is shifted towards the oval window and different end organs of the auditory nerve are stimulated. As the magnitude of the stimulus is increased, the deflections of the basilar membrane increase in magnitude and the stimulation of the nerve endings is increased correspondingly.

The functions of the outer ear, consisting of the pinna and the auditory canal and terminated by the eardrum, is to serve as a transducer and pressure amplifier interposed between an external sound field and the delicate and small structures of the middle and inner ear. The magnitude of the stimulus acting on the auditory apparatus can be quantitatively evaluated by a measurement of the sound pressure at some convenient point in the auditory canal.

The combination of precise physiological knowledge and expert application of modern test instruments enables communications experts such as those in Bell Telephone Laboratories to accurately appraise every speech level from that of a whisper to ear-shattering tonal sonorities. Thus is the communications art advanced.

### Silver Ink Electronics

How would you solve the very dainty task of providing an intricate wiring system for a novelty radio set the size of a match box?

It looks like a problem which would defy a Swiss watchmaker. The solution is simple: "draw" the "wires" on a piece of paper or thin cardboard. This, literally, is done, using a silver solution as ink. Of all metals, silver is the best conductor of electricity and offers the least resistance to its passage.

Silvered lines on paper carry the intricate electric impulses which tiny tubes "translate" for your ear into a report on a championship fight or a Carnegie Hall concert.

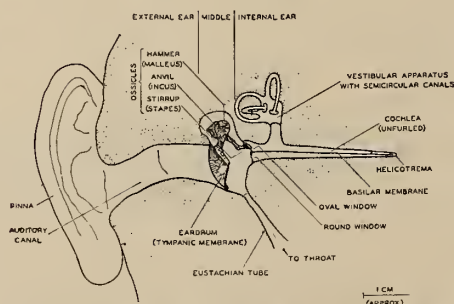


FIG. 1. Schematic cross-section through the human ear.

plied are made of sturdier stuff and, except for their thinness, can be handled in much the same manner as the underlying glass surface. Both require finesse in handling for maximum performance.

It is hoped that these few notes will

aid in keeping your lenses brilliant for the life of the equipment on which they are used, a goal toward which the manufacturer has struggled long and hard. Potentially they can; treated properly they will.



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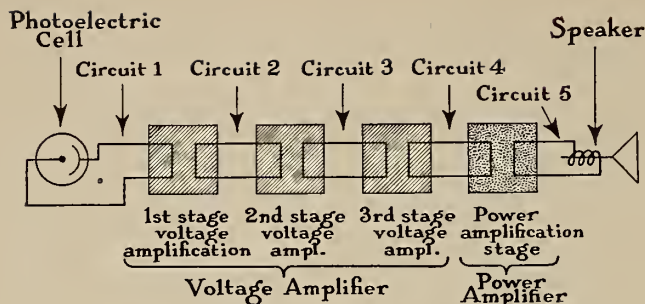


FIG. 1. Representation of an amplifier cascade.

A COMPLETE amplifier consists of several circuits coupled in such a way that power may be transferred from one circuit to another without permitting the electrons flowing in one circuit to pass into another circuit. Omitting all power-supplying units for the sake of simplicity, a sound motion picture amplifier is arranged in *cascade* as in Fig. 1.

It will be seen that there are five separate, yet interdependent, circuits involved in this particular hook-up. It will also be seen that there are four *stages* of amplification, the first three being voltage, or "gain," stages, and the fourth being the power, or output, stage. There is no fixed number of stages in an amplifier, however; but the greater their number, as a general rule, the greater the overall amplification.

#### Voltage and Power Amplifiers

The distinction between voltage amplifiers and power amplifiers is clear. Consider the power amplifier first. The output of this amplifier is connected to the speakers, and speakers are power-operated devices. Power is measured in watts, and watts represent the mathematical product of volts, amperes, and power factor. Accordingly, the tubes of the power stage must handle high values of current (amperes). But in order to perform this function the *signal* (sound current) must be applied to their grids at a wide voltage "swing," or amplitude. It is the purpose of the voltage amplifier to increase the voltage variations to a degree sufficient to work the power amplifier.

Not considering the widely different "amplification factors" of the different types of tubes, we see that several stages of voltage amplification will permit us to use more powerful tubes in the power amplifier than would be the case if we had only one voltage stage. Indeed, sufficient voltage amplification makes it possible to connect two large power stages in parallel or in push-pull and thus obtain sufficient volume to fill the biggest auditorium.

To sum up: the power amplifier provides the sound power that drives the speakers, and the voltage amplifier pro-

vides the signal voltage to operate the power amplifier.

#### Current Components

In order to comprehend fully the action of amplifier stages we must investigate the operation of electron tubes, for the process of amplification takes place inside them. An exhaustive discussion of tubes must be deferred; so for the present

## Sound System Components

### IV. Power Transfer in Circuits

By ROBERT A. MITCHELL

we shall view the amplifier tube more broadly as a *valve* in which a strong d-c is controlled by a weaker d-c, the fluctuations of the latter being reproduced on a greatly enlarged scale in the stronger current.

The important point to grasp is this: it is the *fluctuations*, not the d-c itself, which constitute the signal—the electrical equivalent of sound. The d-c is necessary for the operation of the tube, but only its "waverings" are passed along from stage to stage and built up to a strength sufficient to drive the speakers.

We may take the expression "fluctuating d-c" at its face value, but a little thought will bring us to another way of looking at it: namely, that such a "direct" current possesses to *some* degree the properties of a-c. The "fluctuating" part of it (a-c component) is able to pass through condensers and induce currents in chokes and transformers. The non-

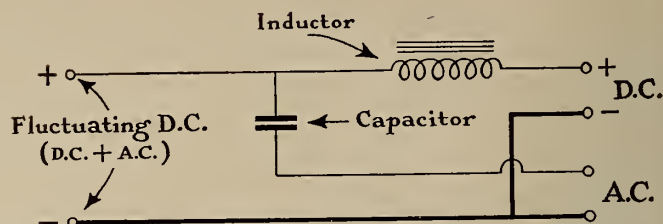


FIG. 2. Filter circuit for separating the two components of fluctuating direct current.

varying part (d-c component) is exactly the same as any well-behaved d-c: it will not pass through condensers or induce secondary currents in inductances.

The differences of the two components of a pulsating d-c provide methods of separating them and making them flow in different circuits. Fig. 2 shows an elementary *filter circuit* designed to do this job.

In Fig. 2 the fluctuating d-c input is at the left. The polarity of the input connections is not important, but in deference to long-established convention the negative lead is connected to the ground wire that runs clear through the apparatus. This wire is drawn blacker than the others in the diagram. In an actual apparatus this "floating ground" should be connected to the metal case by means of a short length of heavy wire.

Tracing through the circuit we find an inductance (choke coil having an iron core) in series with the input. An inductance opposes a-c by its reactance, but, if of the correct type, it offers relatively little resistance to the flow of direct current. But the a-c component finds an easy path through the capacitor, which completely blocks the d-c component. In this way the two components are separated and diverted into different channels.

In Fig. 3 the pulsating d-c is fed into the primary of a transformer. The a-c component induces a-c in the secondary winding, while the d-c component only flows through the primary without transferring any power to the secondary.

This is a very practical set-up for obtaining the a-c component free from d-c, but when the a-c component is small in comparison with the d-c component, the primary of the transformer may be

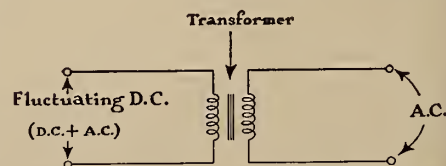


FIG. 3. Circuit for separating an a-c component.

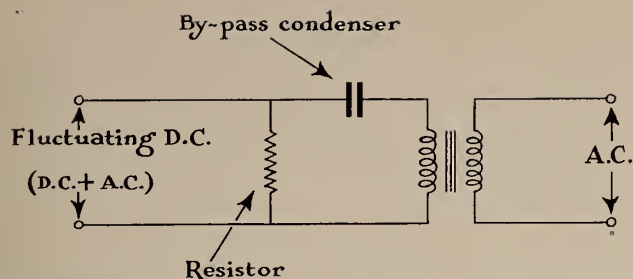


FIG. 4. Separating a-c when the d-c component is too large to be safely carried by the transformer primary.

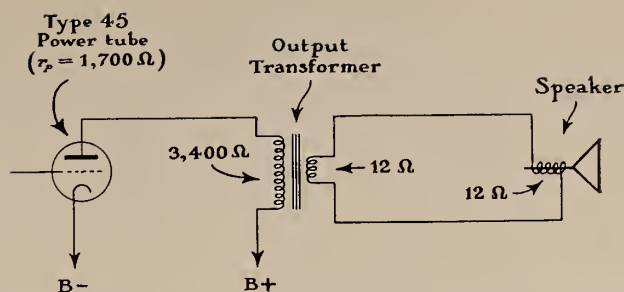


FIG. 6. Impedance match in power amplifier plate circuit and in speaker circuit.

burned up by the heavy direct current.

There are two ways of circumventing this difficulty. We may substitute a transformer of very great current-carrying capacity; but large transformers are expensive. As an alternative we may interpose a capacitor in the primary circuit. The capacitor will by-pass the a-c and keep the harmful d-c out of the transformer. But here again we find ourselves in difficulties, for amplifier plate circuits must carry rather high d-c voltages, and the capacitor prevents the d-c from flowing.

This problem is solved by using a resistor shunt (Fig. 4) the purpose of which is to pass d-c while the condenser passes the a-c. The efficiency of this hook-up is certainly not of the highest order—a-c is drained off through the resistor and wasted—but this method has been used in cheaply built amplifiers with fairly good results.

The actual design of filter and a-c transfer circuits such as these calls for consideration of the strength of the d-c component, the maximum amplitude of the a-c component, the frequency or frequencies of the modulating a-c (30 cycles to 9,000 cycles in sound current), and the impedance of the source. We shall see shortly that the impedance of both "source" and "load" is an extremely important factor in amplifier circuits.

So far we have considered only methods of separating the two components of pulsating d-c. One of these methods—that of using a transformer to obtain the a-c component free from d-c—serves as a very simple means of transferring sound current (the a-c component) from one amplifier stage to another. There are two other widely used methods of circuit coupling, but the purpose of each is to transfer pulsating d-c to a load resistance or impedance, and to apply the separated a-c component to the grid of an amplifying tube or to the voice coil of a speaker.

### Action of the Tube

Figure 5 represents the plate circuit of a rudimentary amplifier stage. This may be either a voltage stage or a power stage; we cannot tell by looking at the picture. The tube is represented by a

circle (the glass envelope) in which are located the *plate*, the electron-emitting *cathode*, and, interposed between them, the *grid*.

When the cathode is heated, as by a hot filament, current from the "B" battery will flow through the vacuum from the cathode to the plate, thence around the circuit through the load and back to the battery. Note that the negative terminal of the battery is connected to

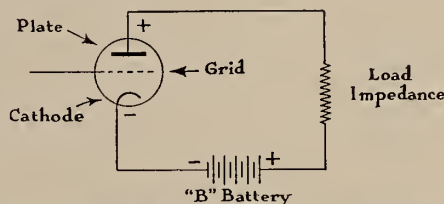


FIG. 5. Plate resistance and load impedance.

the cathode. If the connections are reversed, the tube will not work.

Now, the electrons emitted by the hot cathode and drawn across the vacuum to the positively-charged plate are required to pass through the mesh of the grid, which is usually made of wire gauze. The varying negative charge placed on the grid by the source of sound current or a previous amplifier stage regulates the current-flow from the cathode to the plate.

When the grid becomes strongly negative, the negatively-charged electrons are repelled and only a few of them manage to pass through to the plate. When the grid becomes less negative, more electrons are allowed to get by and a heavier plate current results. The plate current

therefore varies according to the fluctuating charge of the grid.

The grid is very much like a traffic light controlling a stream of cars (electrons). A low negative charge is the green light, and a high negative charge is the red light. When the red light is on, only a few very daring individuals dash through. It might seem as though a positive charge on the grid would be the best sort of "green light" for the electrons. Actually, a positive swing introduces serious distortion into the sound.

In Class A amplifiers the grid does not even swing to neutral (no charge), for that would also distort the sound. Class B and C amplifiers have important applications in radio work; but in motion picture projection we are interested only in high-fidelity Class A amplifiers, those in which the tube grids are always more or less negatively charged.

### Source and Load Impedance

The purpose of the plate circuit (Fig. 5) is to transfer power to the load impedance. The load impedance may be a plate resistor, or it may be a load inductance or the primary of a transformer, depending on the method of coupling. Just for a moment let us consider it to be a pure resistance.

Suppose the resistance which the current encounters in passing through the tube from cathode to plate (plate resistance, represented by  $r_p$ ) is 10,000 ohms. If we assume a value of 1000 ohms for the load resistance (R) the total resistance of the circuit is 11,000 ohms. If the plate supply is 250 volts, the current

PLATE VOLTAGE	PLATE RESISTANCE Ohms	LOAD IMPEDANCE Ohms	PLATE CURRENT Milliamperes	LOAD DROP Volts	LOAD POWER Watts
250	10,000	1	25.00	0.02500	0.0006250
250	10,000	10	24.98	0.2498	0.006240
250	10,000	100	24.75	2.475	0.06126
250	10,000	1,000	22.73	22.73	0.5167
250	10,000	10,000	22.50	225.0	5.063
250	10,000	100,000	2.273	227.3	0.5167
250	10,000	1,000,000	0.2475	247.5	0.06126

TABLE A. Voltage and power transfer with different values of load impedance.

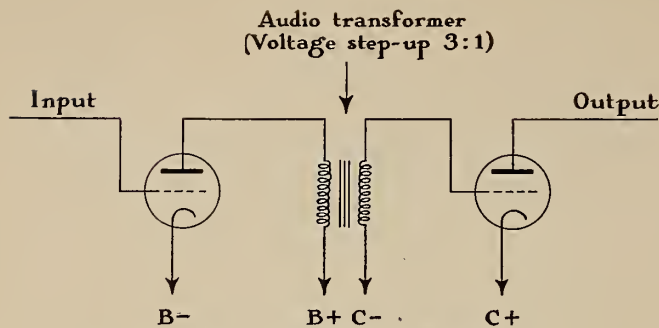


FIG. 7. Transformer coupling.

flowing through the circuit (plate current) is:

$$I = \frac{E}{r_p + R} = \frac{250}{11,000} = 0.02273 \text{ amp.}$$

The voltage-drop across the plate resistor in this case is:

$$E_R = IR = 0.02273 \times 1000 = 22.73 \text{ volts.}$$

Now this corresponds to a power of:

$$P_R = I^2 R = (0.02273)^2 \times 1000 = 0.5167 \text{ watt.}$$

Let us now try other values for the plate resistor to find out if some other value will give us more power. The results may be tabulated as in Table A.

### Impedance Rules

The accompanying table reveals that (1) for a maximum transfer of power the load impedance should be equal to the "source" impedance (here the plate resistance); and (2) for a maximum drop of voltage, the load impedance should be as high as possible.

The second of the two aforementioned "rules" interests us when we have voltage amplifiers under consideration. In actual practice we must choose the highest value for the load impedance which permits the proper voltage to be applied to the plate of the tube from the B battery. In a power amplifier the load impedance is ordinarily the primary of the output transformer. The d-c resistance of the primary should be low enough to permit a reasonably large current to flow through the plate circuit.

Strange as it may seem, the first of the two aforesaid impedance rules is usually

disregarded in interstage coupling. This does not mean that the rule is not true. If we wish a maximum transfer of power, we absolutely must make the load impedance equal to the plate resistance. But it is found that when a tube is operated with so low a value of load, considerable harmonic distortion is produced in the sound. Distortion must be avoided at all costs!

So we compromise a little and make the load impedance twice the plate resistance of the tube. We lose a little power by so doing, but that is a small price to pay for freedom from distorted sound. Further, if we make the load impedances about five times the plate resistances in the voltage-amplification stages, we will stand a better chance of keeping second-harmonic distortion under the 5% limit. Carefully conducted tests have proved that the human ear cannot detect second-harmonic distortion of 5% or less.

### Second-Harmonic Distortion

The first harmonic of a tone is twice the fundamental frequency of the tone. The second harmonic is twice the frequency of the first harmonic. Thus the second harmonic of a 300-cycle note is 1200 cycles. Practically all natural sounds are rich in harmonics—they provide the distinguishing tonal characteristics called quality, or timbre—but we must not tolerate an amplifier that introduces harmonics not present in the original sound!

When an amplifier produces second harmonics, not only the fundamental frequency of the original sound but all its natural harmonics are supplied with

spurious second-harmonic components. The result is a very harsh metallic quality.

As a general rule, then, we make the load impedance at least twice the value of the plate resistance of the tube. But when we come to speaker circuits we adhere to the rule of maximum power transfer and obey it to the letter.

If, for example, the voice-coil impedance of a speaker is 12 ohms, the secondary winding of the output transformer should have an impedance of 12 ohms. If we replace the speaker with another having a very different impedance, we must perforce also replace the output transformer with one that provides matched impedance to the new speaker.

### Transformer Coupling

Several examples of transformer coupling have already been given. (See Figs. 3, 4, and 6.) When this type of coupling occurs in a voltage stage, the output of the transformer is added to the grid-bias voltage of the next tube for further amplification. The details of the grid circuit are left for future consideration, hence are omitted from Fig. 7.

Transformers intended for interstage coupling are called *audio transformers*. These transformers usually have turn-ratios of 3 to 1, the primary being the coil with the fewer turns. An audio transformer is therefore a step-up transformer, increasing the voltage almost three times. Due to factors of winding capacitance, a higher turn-ratio is considered incompatible with high standards of sound reproduction.

Transformer coupling is so simple and

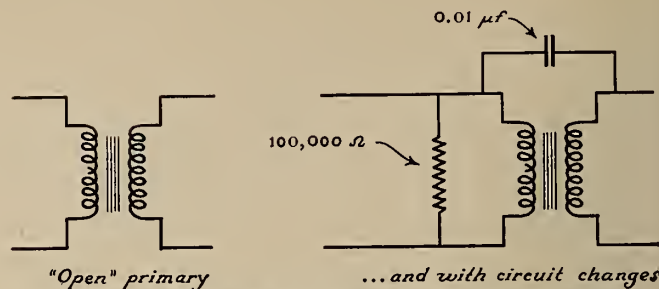


FIG. 8. Emergency hook-up for burned-out transformer primary.

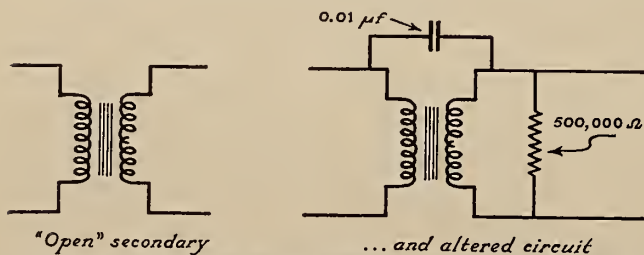


FIG. 9. Emergency hook-up for burned-out transformer secondary.

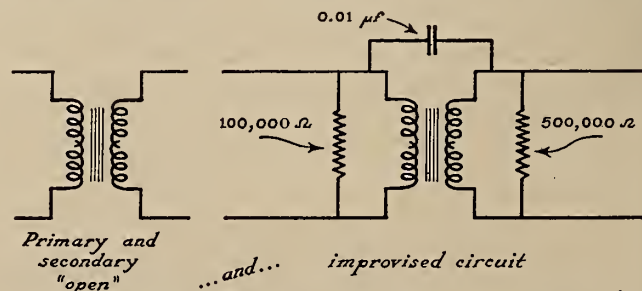


FIG. 10. Emergency hook-up when both primary and secondary of transformer are open.

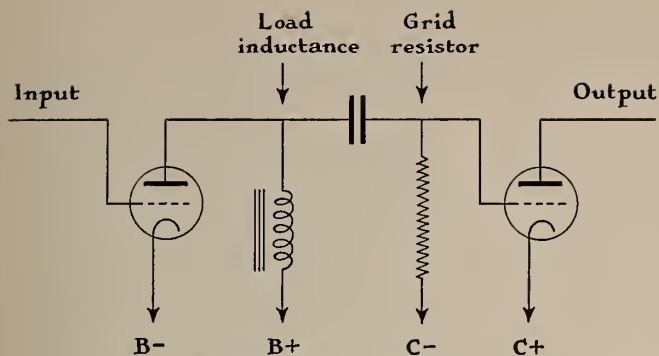


FIG. 11. Representation of impedance coupling.

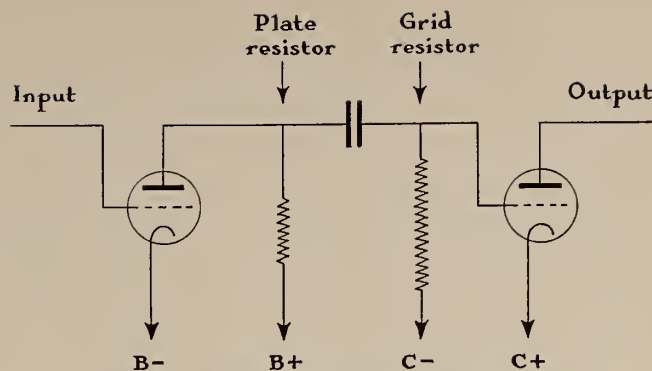


FIG. 12. Representation of resistance coupling.

efficient that it would appear to commend itself at once to all builders of amplifiers. Such, however, is not the case.

First of all, transformers are rather expensive, but what is more important, transformers introduce undesirable "peaks" (frequency distortion) and spurious frequencies (harmonic distortion) into the sound. So in order to keep the distortion factor below 5% we must look to other methods of coupling.

A few of the first amplifiers built for sound pictures employed interstage transformer coupling much too often. It is consequently impossible to obtain sound of acceptable quality from these old-fashioned equipments. A new speaker assembly accomplishes little when the need is a new amplifier. Modern manufacturers avoid the use of transformers as much as possible. But some of the earlier amplifiers are still in use, hence a few "kinks" that will enable a projectionist to keep the show running in the event of a burned-out audio transformer.

Assume that tests indicate an open primary. A 100,000-ohm resistor is connected across the open primary, and the terminals marked P and G are connected through a 0.01-microfarad condenser, as in Fig. 8. This value of capacitance is not "cut and dried," but may be varied within wide limits. In certain cases a 0.005-microfarad capacitor gives better results. If possible, select a mica condenser for the "coupling capacitor."

When the secondary is open, a 500,000-ohm resistor is connected across the secondary terminals, and a 0.01-microfarad capacitor is thrown across the P and G terminals, as before (see Fig. 9). Both these emergency hook-ups change the transformer coupling to impedance coupling. These hook-ups will work excellently, but some volume will probably be lost, necessitating a volume setting several steps higher than normal.

In case both primary and secondary of an audio transformer have gone bad, we have simply to combine the foregoing two emergency hook-ups. Fig. 10 shows the altered circuit. These changes convert the transformer coupling to resist-

ance coupling, the best type of all when high-fidelity reproduction is considered. However, the volume will be cut down rather sharply.

**WARNING:** These emergency measures are intended to correct defective audio transformers, and are *not* suitable for application to output or speaker-matching transformers.

### Impedance Coupling

*Impedance coupling* represents an attempt to do away with much of the distortion inherent in transformer coupling and yet permit sources of "B" current of lower voltage than is possible with resistance coupling, soon to be described. A choke called a "load inductance" takes the place of the transformer primary. The a-c voltage developed across this choke is transferred to the grid of the subsequent tube through a coupling condenser. This condenser (about 0.01  $\mu$ f) keeps the large positive charge from the B battery off the grid of the tube. The voltage-drop developed across the grid-leak resistor combines with the negative charge of the C battery to give a varying negative charge on the grid.

### Resistance Coupling

When the maximum degree of fidelity is desired in the output of an amplifier, *resistance coupling* is used throughout the voltage stages and between the last voltage stage and the power stage. Because a fixed value of resistance offers practically the same impedance to all frequencies of a-c, the "response" of resistance-coupled amplifiers is substantially "flat" and free from second-harmonic distortion. This does not mean that an amplifier employing this method of coupling is *a priori* perfect, for distortion may be caused by a number of factors; but a resistance-coupled amplifier of balanced design and utilizing degenerative feedback may reasonably be expected to give top-notch results when connected to a high-quality speaker combination.

Figure 12 illustrates resistance coupling. The close similarity of this method to impedance coupling is apparent at a

glance. The only difference is the substitution of a plate resistor for the load inductance.

The plate resistor is the load to which the tube transfers its power. The value of this resistor should be two or more times the plate resistance of the tube. If there is any uncertainty, the mistake should be made on the "large" side—that is, the resistor should have a higher resistance than is absolutely necessary.

The grid-leak resistor may have a resistance value of about 500,000 ohms (0.5 megohm). The coupling capacitor is best about 0.01  $\mu$ f, and it should be a mica condenser to avoid the danger of slight "leaks" which would alter the "grid bias," the delicately adjusted negative charge placed on the grid of the following tube.

[The End]

### 'Journal of Commerce' Views '49 Biz

Motion picture business will be merely "terrific" instead of "sensational" as in the immediate postwar period, according to an article appearing in the *Journal of Commerce* (New York). Earnings during 1949 are expected to match those for 1948, states the story, because of the economy programs instituted of late and through the amortization of expensive features made at comparatively high cost.

The story points out that theatre attendance has "apparently stabilized" at from 12 to 15% below the 1947 level, with the last months of 1948 and the first month of this year holding much promise for sustained patronage.

### Writing Your Signature in Silver

How would you sign your name on glass? That's a problem makers of radio and television tubes faced. They wanted their products "branded" with their trademarks.

They found the answer: they sign with silver—and it's as simple as rubber-stamping. The "ink" is silver oxide mixed with bismuth and glycerine. After stamping, the tube is heated. The silver oxide becomes pure silver—and the maker's signature is there to stay. Thus there was chalked up another score for silver, the most versatile industrial metal.

# The New M-G-M Stereopticon

By MERLE CHAMBERLIN

Chief Projectionist, Metro-Goldwyn-Mayer Studios

**B**EFORE we proceed with a description of the new M-G-M stereopticon, it might be well to explain why we need and how we use this unit of projection equipment. As pointed out previously in IP, background projection is a vitally important function of the projection department in a motion picture studio. This specialized work involves the projection of both motion pictures and slides, the latter being used on sets where the background requires no animation or movement. Due to variations in set dimensions, the projected width will range from 2 to 40 feet.

Up to the present time we did this work with an assembled machine. This equipment being strictly an assembly job, numerous additions and deletions were made as the occasion arose. This unit was never too successful, but it did get us by.

Experience having taught us what was required, we proceeded to design a machine that would successfully meet the manifold requirements as a stereopticon. This equipment would be required to project any stationary glass or film picture from 2 x 2 transparencies to full size slides. The amperage range should be from 90 to 250 to compensate for varying densities in original material. Slides must be left on for periods up to an hour without endangering either glass or emulsions. The machine also had to be flexible from the standpoint of a maximum panning and tilting range.

## Stereo Requirements Satisfied

We now have a unit that meets all the aforementioned requirements. Fig. 1 shows the complete machine; Fig. 2 shows the inside of the working head.



FIG. 2. Interior of M-G-M stereopticon.

This machine has been put through every kind of test we could devise and it has responded efficiently. Consider Fig. 2.

Any size slide may be mounted in the holder, *A*. The slide is suspended instead of being clamped, to allow for heat expansion and contraction of the basic slide material. Amperage range is taken care of by an adjustable grid carried with the machine. Slides can be left on for any period of time, due to the cooling system used.

First, a large amount of the heat is dissipated by passing the light through a water cell, *B*. The slide-holding area is cooled by two air ducts, *C*, which are fed by the blower *D*. The speed of this blower is governed by an adjustable rheostat.

In cases of extreme amperage and/or slide density, the shutter *E* is used. This projector shutter is synchronized with the camera shutter by means of interlocking motors *F* controlled by a distributor operated by the projectionist. Manual control of this shutter is by means of the knob *G* on the front of the head.

## Dual Lens Mount Control

The lens mount *H* is flexible so as to permit the use of any diameter lens. Movement of this lens mount is by a motor *I* which is controlled by the projectionist, but control can be switched to the cameraman, thereby permitting focus

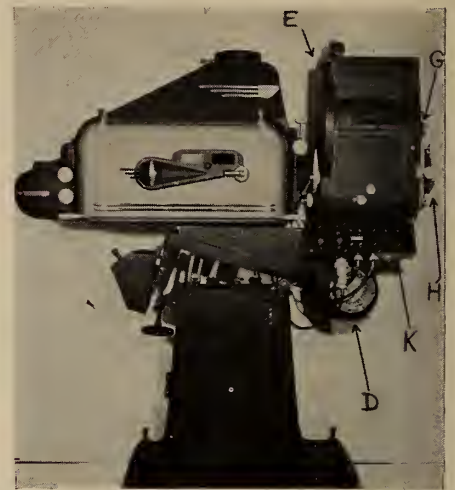


FIG. 1. Complete assembly of M-G-M stereopticon mounted on a Simplex LLI base.

of the picture by the viewer. This control is by switches *J* mounted on the head.

The panel *K* includes necessary d-c and 3-phase a-c remote switches. The base is the standard Simplex LLI heavy duty type, with the mounting plate modified for this specific piece of equipment. The lamp is the standard Peerless Hi-Candescant.

This machine was designed and fabricated by projectionist members of Local 165 and Cine Technician members of Local 789, IA, working at the M-G-M studio. We admit that our stereo is a far cry from those magic lantern jobs of days gone by, but we feel that this machine is one of the most advanced and practical pieces of equipment of this type in the industry.

## Addendum: SMPE 64th Convention Papers Abstracts

**N**OW available are the balance of the abstracts of papers presented before the last, 64th, Convention of the Society of Motion Picture Engineers. Abstracts of those papers of especial interest to projectionists are appended hereto:

### WHAT IS HIGH-SPEED PHOTOGRAPHY?

Maynard L. Sandell  
Eastman Kodak Company

High-speed photographs are defined as those (a) in still photography, having exposures in excess of 1/1000 second and (b) in motion picture photography, having exposures in excess of 1/250 of a second. The history of photography of this type is briefly discussed.

### ELECTRICAL FLASH PHOTOGRAPHY

Harold E. Edgerton  
Massachusetts Institute of Technology

The circuits and components now in use in the production of electronically-controlled flashes for photography are described, together with a method of measuring the

integrated incident light from flash sources and a meter for making the measurement. The theory and design of light production and methods of calculating exposure, especially for color materials, is discussed.

### NEW HIGH-SPEED STROBOSCOPE FOR HIGH-SPEED MOTION PICTURES

K. J. Germeshausen  
Massachusetts Institute of Technology

A high-speed stroboscopic source of light has been developed which will minimize the lack of definition cited as a major disadvantage of optical type high-speed cameras. The advantages of this type of light source over others are discussed and examples given of the benefits accruing from an intermittent source of light.

### LAMPS FOR HIGH-SPEED PHOTOGRAPHY

R. E. Farnham  
General Electric Company

This paper discusses the general requirements of light sources for high-speed motion

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IT APPEARS that to reproduce color one would have first of all to know all about color. However, just as in black-and-white photography, the applied art seems to have flourished remarkably and developed its practical methods toward more perfect results without too much worry about the many question marks, which still make those concerned with photo-reproductive theory wonder about the true nature of its fundamentals.

The fact that we resort to at least three different theories explaining the phenomena of light—the electro-magnetic, the corpuscular and the quantum theories, instead of a single one—is sufficient proof that we are still groping for basic truths.

The science of color presents not only an alarming number of difficult questions relating to pure physics. A large part of what we know of color reactions defies explanation through an approach by physics. It can only be properly understood, described and classified as psycho-physical and as psychological phenomena, or as color sensations.

### Color Photography Basis

The recognition of the fact that by mixing three primary colors—red, green and blue-violet—in different proportions any other color can be obtained or matched had slowly grown out of the practical experience and observations of early painters. It became the lasting contribution of Thomas Young to furnish accurate experimental proof and formulate it into a basic law, which in consequence seemed to require the assumption that the human eye must be equipped with three receptors, each sensitive to only one of the primary colors. This theory, although physiologically not at all proven, has furnished the foundation upon which color photography has been begun and developed.

The additive primaries, of which little can be said as to their physical properties since color itself is not a *substance* but a *sensation*, have certain characteristics which distinguish them from other colors. One is that none of them can be matched by any two other colors. A further observation is that all three primaries, when mixed additively, result in the sensation of white.

### Three Complementary Primaries

From this follows that the additive mixture of two of the primaries is, in each instance, complementary to the third primary, since we also know that complementary colors are colors which when additively mixed will result in white.

The colors of the three complementary or secondary primaries which we use in

synthesizing the color print when practicing the subtractive process are: *cyan*, complementary to primary red; *magenta*, complementary to primary green; and *yellow*, complementary to primary blue-violet.

It follows, therefore, that cyan must be the same as the additive mixture of primary green and blue-violet, which, as was stated, is also complementary to red. This explains the often used other name for cyan, which is *minus red*. Similarly, it follows that magenta must be the same as the additive mixture of primary blue-violet and red and is, therefore, called *minus green*. Last, yellow must be equal to the additive mixture of red

In the additive process of color reproduction the individual print from each of the color separation negatives is illuminated in projection by light identical in color composition to that transmitted by the corresponding primary exposing filter. The print itself is black-and-white, and the different densities merely modulate the amount of colored light passing through the silver image. This modulated light from each print is superimposed and additively mixed on the screen. Black is, therefore, obtained where all three colored light sources are prevented from reaching the screen by heavy, opaque silver deposits. White is obtained when all all three

## Color: Its Complex Structure†

By DR. HERBERT MEYER

Motion Picture Research Council

and green and is accordingly named *minus blue* (blue-violet).

The two fundamental processes used for photographic color reproduction are known as additive and subtractive methods. In making the negative exposure, in order to obtain color separation negatives, identical primary color filters can be used for either method. These filters are practically standardized as red filter A (dominant wave-length 610 millimicrons); green filter B (dominant wave-length 546 millimicrons); and blue filter C-5 (dominant wave-length 649 millimicrons).

The eye can not distinguish the individual components in a color mixture, which is rather advantageous in color reproduction since it makes it permissible to use filters or dyes which transmit relatively wide or widely separated bands, instead of one narrow-banded, monochromatic hue. The dominant wave-length of a filter, therefore, represents the mean hue transmitted by the filter.

The length of a single wave of visible radiation is exceedingly small, so that to avoid the difficulty or awkwardness of thinking and speaking in such small figures, wave-length is customarily expressed in millimicrons or in Angstrom units.

1 millimicron = .000001 mm

1 Angstrom unit = .0000001 mm

The visible range of the spectrum reaches accordingly from:

400 to 700 millimicrons

4,000 to 7,000 Angstrom units

colored light bundles reach the screen in *equal intensities*.

In the subtractive process of color reproduction the individual prints (or print layers) of each of the color separation negatives are dyed in their respective complementary colors and superimposed upon each other prior to projection. This combined, multiple-dyed print is then projected on the screen with white light.

Since, in this instance, each dyed component absorbs its complementary part of the all-color mixture of the white light, it follows that this type of projection is subtractive, which means that where no dye interferes with the projected white light, the screen reflects white; where all three dyes interfere in equivalent densities, the screen will be black, since all components of the white light are absorbed and prevented from being transmitted through the film on to the screen.

### Measurable, Reproducible Factors

The field of measuring colors is called "colorimetry". One of its more recent endeavors concerns the systematic determination and classification of colors on the basis of measurable and reproducible units or factors. It establishes for this purpose numerical values for three specific attributes of colors which determine qualitatively and quantitatively their relations and differences. These attributes are, in the order of their

(Continued on page 26)

† American Cinematographer for Jan., 1948.

# Stability vs. Chaos in Tv.

*A summary of what's right and what's wrong about the video art by an acknowledged expert. No stranger herein, the author is an honorary member of IA Local 306 and also of the 25-30 Club of New York City.*

By DR. ALFRED N. GOLDSMITH

**T**HERE are numerous occasions, these days, when any impartial observer of television events has the impression that all is hurry and scurry with but little definite direction. One is reminded of Stephen Leacock's description of the knight in the Middle Ages who jumped on his horse and galloped off wildly in all directions. It is always difficult—and sometimes impossible—to reach any desired destination in that inappropriate fashion.

Television is an inspiring field, and many people, naturally enthusiastic, get more or less novel ideas concerning techniques, programming, regulatory, engineering or other matters. Some of these ideas are actually new; others are merely rehashed versions of unsuccessful and discarded thoughts of the past.

## Open Sesame for Ideas

It would be reasonable to expect that all proposed ideas receive some attention and analysis. Growing fields like television should never close their doors to the pioneer and innovator. On the other hand, this does not in the least imply that every new idea must be instantly adopted or caused to block current progress. It is possible to be so open-minded that one merely becomes empty-minded.

Many individuals who have little beyond enthusiasm receive public notice of their ideas in high places. Even the Federal Communications Commission seems unusually responsive and sympathetic toward proposals some of which are radical and of an untried nature. Apparently, too, it is easier to "break the headlines" with a new television idea than in almost any other field.

## Television's Essential Vitality

Whenever any difficulties arise in the daily practice of television broadcasting (and they do occur, as in almost any other field), the tendency is to shout: "Hold everything!" This is usually followed by a period of study, standstill, and inquiry which also becomes a period of uncertainty and partial stagnation. It is, in fact, a tribute to the vitality of television that it has survived the disorder, injury, delays, and confusion which result from serious proposals to accept untried new ideas, usually without adequate field tests or manufacturing experiences.

These comments should not be misinterpreted as indicating opposition to all

changes in television. Tested and advantageous changes should always be accepted, on reasonable notice and at an appropriate time. Let us admit, for example, that television could use a number of additional channels below 300 mc., or even below 200 mc. The stations that would be established might not be

able to operate economically, but at least the addition of numerous stations would satisfy applicants, simplify the task of the regulatory authorities, and lead to increasingly vigorous competition.

Whether such competition would improve the service of any stations and whether it might not lead to the untimely demise of some stations is another matter.

## Encourage Experimental Research

But let us admit also that it is possible that some day television broadcasting above 500 mc., or even above 5000 mc., will be found useful. To be sure, operation at these higher frequencies will require high power, possibly new tech-

(Continued on page 30)

## Strobo Discs for Both 60- and 50-Cycle Power Supply

From the hinterlands of the U. S. as well as from foreign fields come questions anent to a practical service item bearing upon a method for checking projector running speed which appeared in IP several months ago and which was applicable only in those situations where 60-cycle current was available. In the interest of clarity, and for the purpose of comparison, we present here the original item and an addendum which describes the use of this device with 50-cycle current.

**C**UT out one of the Strobo discs shown here and paste it to the end of a sprocket, using household cement or shellac. After the cement has thoroughly dried, hold a lamp in front of the disc and observe its motion. The lamp, of course, must be plugged to a 60-cycle current source. For better results, use a small neon light available at any radio store.

If the Strobo disc appears to rotate in the same direction as the sprocket, the projector is running *above* normal speed. If it appears to rotate in the opposite direction, it is running *below* normal speed. If it appears to stand still, it is running at the *normal* speed of 360 r.p.m.

If the projector is running above or below normal speed, the exact speed may be determined by counting the number of times the disc appears to rotate in one minute. For example, suppose that the disc appears to rotate six times per minute in the same direction as the sprocket is turning: then the actual speed of the sprocket is 360 *plus* 6, or 366 r.p.m. If the disc is turning in the opposite direction, then the speed is 360 *minus* 6, or 354 r.p.m.

Expressed in terms of film in feet per minute, the speed for both these conditions will be (for above normal):

$$\frac{360 + 6}{360} \times 90 = 91.5 \text{ feet per minute;}$$

or for a speed below normal:

$$\frac{360 - 6}{360} \times 90 = 88.5 \text{ feet per minute.}$$

Now, the disc shown here was de-



signed for 60-cycle current. Placed on a shaft which rotates at 360 r. p. m., or 6 r.p.s., the disc contains 20 segments of each color (black and white), thus 120 segments pass a given point each second. An incandescent light operating on 60-cycle power radiates 120 pulses of maximum radiant intensity per second, thus one segment of the disc passes a given point per each light flash, and, if the shaft speed be correct, the pattern appears to stand still.

## 50-Cycle Current Requisites

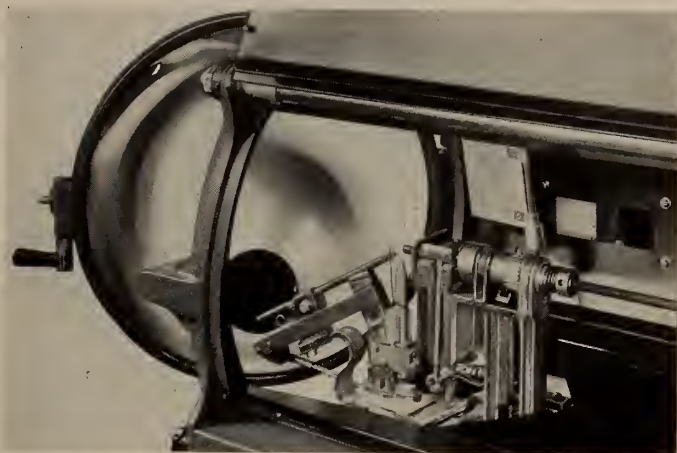
The use of this disc with 50-cycle current is, however, quite a different proposition. The 50-cycle current flashes only 100 times per second, thus the pattern shown here would move rapidly when the shaft speed is correct.

However, if the number of segments on the disc be increased to 50, there would be 300 segments passing a given point per second, which figure is exactly three times the rate at which light flashes with 50-cycle current. Under this setup the pattern will again appear to stand still at the correct sprocket speed.

No lesser number of segments than 300 will satisfy the requisites of 50-cycle current that there be an integral number of segments and that the number of segments passing a given point per light flash must likewise be an integer.

# New Motiograph-Hall H-I Arc Lamp

Rotating Arc, Reflector-Type Unit Rated at 75-115 Amps.



Detailed view of the Motiograph-Hall 75-115 ampere H.I. lamp, showing carbon positioning, rotating positive, and 16-inch reflector.

**M**OTIOGRAPH has rounded out its line of projection and sound equipment and has made a noteworthy contribution to the ever-increasing demand for more screen light with the introduction of its new Motiograph-Hall high-tensity carbon arc lamp, now ready for general distribution. Originally designed for drive-in theatres with their tremendous picture sizes and extremely long viewing distances, this new lamp is equally adaptable for large enclosed theatre operation.

Especially interesting in connection with this development is the reappearance in a major projection enterprise of the name of Hall, which will be readily identified by veteran projectionists with Theodore O. Hall, inventor of the old-time Sunlight Arc and founder of Hall & Connolly, for many years practically the sole manufacturers of rotating high-intensity arc lamp. Hall is now associated with Motiograph, and having designed this new lamp, he will supervise its manufacture.

## Rotating Arc, 16-Inch Mirror

It was perhaps inevitable, therefore, that this new lamp should utilize a rotating arc, although its combination with a reflector mirror instead of the conventional condenser optical system which invariably has been used with this type of arc constitutes a sharp departure from conventional procedure.

The Motiograph-Hall lamp utilizes a 16-inch mirror, and it may be operated with either a 9- or 11-mm positive carbon in conjunction with a 5/16 x 9-inch negative. The lamp is designed to operate efficiently within the range of from 75 to 115 amperes.

The reason for the adoption of the rotating arc is, of course, obvious: it permits the use of larger carbon trims burned at higher amperages than is possible with a straight arc; moreover, such an arc enables a more precise positioning of both negative and positive carbons in relation to each other and thus effects a more efficient carbon-burning pattern in terms of a higher level of incandescence in the positive crater, with accompanying greater brilliance.

Under these circumstances, the use of a larger light-collecting medium—in this case a 16-inch mirror—is definitely indicated.

It is apparent, therefore, that the *individual* worth of these elements is beyond question; but their use in *combination* gives rise to a train of speculation which may not be satisfied on any basis other

## Ultra-Sensitive Color Analyzer

A new machine which can tell blue from blue and red from red has been developed. It is an electric color analyzer so sensitive that it will detect other color differences too small to be seen by the average human eye, it is announced by Ansco. The instrument can measure 1/100,000,000 of the light emitted by an automobile headlamp.

Production of Ansco color film prompted the need for such a device, and it is expected to play an important part in cancer research on the basis of recent studies which indicate that blood changes color during progression of the disease. Although designed primarily for photographic work, the instrument, known as the Ansco color densitometer, can be adapted to scores of other uses in many other fields, such as measuring or matching colors in textiles, paints and dyes, and in medical research.

than extensive use under actual field conditions—so many hours of use per day over a given period. Motiograph stresses the design feature which permits more than adequate ventilation, and it is taken for granted that their own field tests have justified this assertion.

## Carbon Trim, Lumen Production

The 9- and 11-mm carbons cited as suitable for use in the M-H lamp (along with a 10-mm trim understood to now be in the experimental stage) are the uncoated type, that is, they are “bare” without copper coating.

Motiograph asserts that this new lamp will produce 19,000 screen light lumens when operated at only 85 amperes. This is an extremely high figure, particularly when compared with the 18,500 lumens produced by a condenser-type arc lamp when operated at 170 amperes. While having no doubt that Motiograph has fully field-tested this lamp in terms of light-producing ability, IP will have to withhold comment on this figure until such time as laboratory test results are available.

Operationally, this new lamp offers no unusual problem for the experienced projectionist, and in any event Motiograph has made available for all installations an unusually detailed instruction book which should serve to surmount any possible difficulty.

The lamp has an automatic focus control—a combination optical and electrical device—which serves to hold the crater of the positive carbon at the exact focal point of the mirror within the very narrow limits of 7/1000th inch, a margin which renders practically impossible those light variations which impair the screen image.

Once the lamp is struck, the projectionist need only watch a pilot light which indicates lamp performance, and an audible signal is employed as a warning of either failure of control power or a shortage of carbon in the positive holder. The light flashes when the automatic control goes into action. When

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Exterior of Motiograph-Hall lamp.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**U**NIVERSAL Pictures recently announced that its 1948 operations up to October 30 last resulted in a net loss of some \$3 million, as compared with a net profit of \$3½ million for 1947. This set off another series of "I told you sos" by those newspaper and radio columnists who almost daily predict the imminent death of the movie industry as now set up.

While we're not privy to the accounting methods employed by Universal, we think it very significant that the company's 1948 revenues were the highest in its history, excepting 1947. Possibly a partial answer to this perplexing question lies in the following quote from the nationally syndicated movie column by Sheilah Graham under date of Feb. 1:

"Deanna Durbin will get \$225,000 for three films *she won't make*" (italics ours). "It's a bonus of \$85,000 per. By contract with U-I she is supposed to make them by August, but probably will make none. Yet she collects."

Not meaning to pour it on Universal exclusively, we quote another engaging item from the same column:

"Paulette Goddard wouldn't say yes or no for a whole year on 'Anna Lucasta.' If she gives in, it will be at \$17,500 a week, plus 20% of the profits."

Now, in Miss Durbin's case the boys are forced to pay off on an idiocy already consummated; but in Miss Goddard's set-up they are actually begging for the same dose—only more of it. Miss Goddard undoubtedly has many charms, not all of which are hidden, but they seem to come awfully high at \$17,500 per week *plus*. Has anybody ever calculated the overall box-office draw on the Goddard pictures? We doubt it, if only because the executives whose job it is to do such chores are too busy "effecting economies" in terms of layoffs, wage slashes and production "short cuts"—with the latter meaning investing a picture with an odor that definitely is not perfume.

Two items: The Bureau of Internal Revenue reports that Uncle Sam took only 2% less tax money at theatre box-offices during 1948 than he did in 1947. Two top Universal officials—the chair-

man of the board and the president—state *in print* in U's annual report that box-office takes are off "less than 10% compared with 1947," the latter being merely a "phenominal" income year.

You add it up—and don't forget the answer when it's needed.

- Bill Thompson, the aggressive business manager for Local 171, Pittsburgh, Penna., did not accept the usual excuse advanced by many Tv stations that "we are in the experimental stage" when the new remote Tv station, WDTV, made its bow in Pittsburgh recently. He was successful in placing Gene Welday, a Local 171 man, as projectionist for the station.

- Because of the vastness of the territory it covered, making it necessary for many of its members to travel as much as 500 miles to attend the union meetings, the jurisdiction of Local 720, Las Vegas, Nev., was divided with the newly chartered Local 730, Barstow, Calif. (See "IA Elections" elsewhere in this issue for a listing of elected officers.)

- Julius J. ("Chief") Schaefer, who served 25 terms as president of Local 249, Dallas, Tex., was presented last month with a gold life membership card. The presentation was made on behalf of the membership by Paul W. Humphries, newly elected president of the Local.

Born in Abilene, Texas, in 1888, Schaefer operated the first projector to



J. J. Schaefer (left) receiving gold life membership card from President P. W. Humphries of Dallas Local 249.

hit that town in 1906, and that was the beginning of a long and varied career in the movie industry. He migrated to Dallas in 1912 where he helped to organize Local 249, and two years later he was elected to his first term as president.

In addition to his regular job as chief projectionist at the Palace Theatre—a job, incidentally, he has held since the house opened in 1921—he is in charge of a repair shop on Dallas' Film Row and also maintains a shop in his home. He is loved and respected by his fellow craftsmen for his readiness to lend a helping hand to those in need. In other words, an all-around swell guy.

- Wilbur L. Parker, Local 323, Springfield, Ill., died last month at Veteran's Hospital, Jefferson Barracks, Mo. "Web," as he was known to all his friends, was a veteran of World War I and served at various times as treasurer and recording-secretary of the Local. He was a member of the American Legion, Post 32, and of the Masonic Order.

- The father of Jim Gorman, president of Chicago Local 110, died early this month at the age of 88. Jim was on his way to the Local's headquarters to attend the regular monthly meeting when he received word of his father's death, but he continued with his official duties until the business of the meeting was finished.

- At a special meeting, Irving A. Weiss former vice-president of Local 650, Westchester Co., N. Y., was unanimously elected president to succeed Emil Smith, resigned. Anthony Dente, long active in Local affairs, was elected to fill the post of vice-president, vacated by Weiss.

- Human Interest Note: For many years John J. Murdock was a power in show business. He was vice-president and general manager of, first, the old Keith Circuit, then the Keith-Albee organization, and finally of RKO, and as such he wielded tremendous power. He knew managers, agents, actors, bankers, union officials, and all the other diverse personalities that go to make up the entertainment world, and he contributed

nightly to the making of many a career.

Withal, John J. Murdock was a warm and friendly man. He knew many bums, too, and he turned nary a one of them away. He was aptly called Mr. Show Business. It was said, too, that he was the best friend in a manager's spot that the IA ever had.

John J. Murdock died recently and was buried in Hollywood. Twenty-seven (27) mourners attended the church services.

Fame? Friendship?

- John P. Flaherty, Local 163, Louisville, Ky., evidently is well on his way to break the office-holding record in the IA. He was recently reelected to his 25th term as business agent for the Local.

- Bill Canavan, St. Louis Local 143 and former IA president, became a grandfather for the sixth time. No danger of the Canavan clan becoming extinct.

- We were glad to hear that Newt Wallis, former president of Local 105, London, Ont., is well on the road to complete recovery from a serious illness that kept him off his job for the past several months.

- A special vote of appreciation is due Louis B. Goler, member of Local 253, Rochester, N. Y., for his splendid and untiring effort to bring a little cheer into the lives of many war veterans who are still hospitalized. Strictly on his own, Lou buys smokes for these unfortunate shut-ins, runs pictures for them regularly each week, and does whatever he can to help brighten their dreary days.

- Mike Mungovan, business agent of Local 25, Rochester, N. Y., for more years than we can remember, and generally known as the "Grand Old Man," was named honorary president of the Central Trades and Labor Council. Mike presided at the installation last month of the Council's newly elected officers.

- Six more projectionists were inducted into Famous Players Canadian Corp.'s 25-year Club. Each new member was offered his choice of either a gold watch or a \$100 government bond, in addition to a diamond lapel button denoting 25 years service with the company. The new projectionist members are John Sears, Regina Local 295; A. C. Forwell, Kitchener Local 357; W. J. Newman and H. L. McLean, London Local 105; A. C. Roberts, Brantford Local 582, and J. J. Rochester, Toronto Local 173.

- Bradley Callahan, business agent of Local 685, Concord, N. H., was reelected to serve a second term as AF of L representative at the New Hampshire State

## First Payment Under Local 110-Exhibitor Pension Plan

Marking a milestone in theatrical labor history, the first pension check issued under the agreement consummated between Chicago Local 110 and the exhibitor's association last August was tendered to Joseph Greenberg, 75, at a regular meeting on Feb. 3 last. Several hundred members witnessed the event. Greenberg, a member of Local 110 since 1907, was tendered a check for \$500, representing retroactive payments dating from September 1 last year. He will receive at least \$100 monthly for life.

The agreement, drafted six months ago, provided for a 10% wage increase which in its entirety goes into a fund, jointly administered by two representatives each from Local 110 and the exhibitors association, to be used for disability and retirement payments, two weeks vacation annually for every member, and increased sick and death benefits.

Sick benefits are \$30 weekly for the first 10-week period and \$20 weekly thereafter, while the death payment is \$2,000. Heretofore the Local 110 membership paid a special assessment for each member's death, and only 60% of the membership enjoyed paid vacations. Withal, under the new plan individual dues are reduced \$100 annually.

Business manager Gene Atkinson, who with Clarence Jalas, secretary, are the



Business manager Gene Atkinson presenting \$500 pension check to Joseph Greenberg, under Local 110 retirement plan.

Local 110 administrators of the plan, said that the fund now totals \$100,000 and that he foresaw the growth of this figure to more than \$2 million within the five-year span of the agreement. It was announced that 27 Local 110 men who were permanently disabled while working now receive \$100 monthly from the fund.

The amount of individual pension and disability payments, of course, is predicated upon the total amount of money available in the fund for distribution, but in no case will it fall short of \$100.

Legislature. He informed us of the fight now being waged by the combined CIO and AF of L forces to repeal anti-labor legislation in his state. They know they have a tough fight on their hands, but with men like Bradley Callahan in their corner, we feel certain they will come out on top.

- Out-of-town visitors for the month of January: Joe Nuzzolo and Walter Diehl, president and business agent, respectively, Boston Local 182; Richard Fitz, business agent, Local 534, New Brunswick, N. J.; Sydney T. Clark and Harvey Slater, secretary and treasurer, respectively, Providence Local 223.

- St. Louis Local 143 has purchased a print of the IA documentary film and is making it available to all IA Locals in and around St. Louis. This fine and generous gesture by the officers and members of 143 has occasioned considerable favorable comment.

- Mrs. Catherine O'Toole Walsh, mother of IA President Dick Walsh, died at her Brooklyn, N. Y., home on January 11. Her age was 74. Mrs. Walsh, a widow, is survived by five sons, including Dick;

three daughters and a sister. Representatives of many IA Locals attended the funeral.

- John Reisser, one of the oldest members of New York Local 306, is now a widower after 36 years of happy married life. Mrs. Reisser died suddenly last month, leaving John disconsolate.

- Frank Galluzzo, vice-president of Chicago Local 110 and former grand secretary-treasurer of the TMA (Theatrical Mutual Association), was reelected president of TMA Lodge No. 4.

- From time to time we hear of projectionists starting sideline ventures. The latest to come to our attention is Joe Shore, member of Hollywood Local 165, who recently opened a ceramics shop known as the "Milene Shop" at 6673 Hollywood Blvd. The Shore brothers, of whom there are four, are all members of the IA—Marty and Phil, members of Detroit Local 199; and Joe and Jim, Hollywood Local 165.

- Robert W. Greer, now serving his 14th consecutive term as president of Local 386, Columbus, Ohio, recently contributed an article to a local newspaper in

which he deplored the lack of exhibitor interest in the unsafe and unsanitary conditions existing in many projection rooms. He cannot understand Mr. Exhibitor's reluctance to spend a very small part of his huge profits of the lush years in providing his projectionist employes with decent working conditions. In his article, Greer refers to many projection rooms as "hooby traps".

We should like to inform Brother Greer that exhibitor "good will" usually stops short at the projection room door. He will spend oodles of dough for fancy trimmings for the front of the theatre, but becomes panicky at the thought of

spending an extra dollar or two for the good and welfare of the key men in his theatre—the projectionists.

- Preparations are now under way for the 35th anniversary celebration of Local 323, Springfield, Ill., the committee for which will bend every effort to insure the attendance of a representative group of prominent IA personalities.

- Recording Secretary Nick Bonansinga, Springfield Local 323, has taken a leave of absence from his official duties in an effort to regain his health. Nick's dad, Sam, is business agent of Stagehands Local 138 as well as president of the Springfield Federation of Labor.

## PROJECTION NOTABLES AT 25-30 PARTY



In the usual order (front row): P. A. McGuire (International Projector Corp.), recipient of a bronze plaque; Larry Davee (Century Projector Corp.), tendered a gold card; Harry Sherman (IP), who served as master of ceremonies; Morris Rotker (Local 306), outgoing president who also received a gold card; and Cecil R. Wood, Sr. (Local 306), incoming president.

## P. A. McGuire ('Better Projection Pays') Feted by 25-30

THE recent annual installation of officers of the 25-30 Club of New York City provided the setting for a stirring tribute to P. A. McGuire in recognition of his many substantial contributions to both the craft and the art of projection over a period of many years.

While the 25-30 Club provided the setting, it remained for the New York State Association of Projectionists to compress the eulogistic oratory directed at Mac into a beautiful bronze plaque which said it all—only better and shorter. Not to be outdone, the Club presented Morris J. Rotker, retiring prexy, with a similar plaque which expressed the organization's appreciation for his fine leadership during 1947-1948. The Club also honored Larry Davee, of Century Projector Corp., by tendering him a gold honorary life membership card.

Space limitations do not permit a detailed list of all those present, but the goodly turnout included prominent personalities within and without the movie business. Numbered among these, of course, was a group of ranking execu-



**PIONEER IN UNION, CLUB SPONSOR**  
Bob Goldblatt enjoys the dual distinction of having launched IA Local 306 as well as sponsored the 25-30 Club.

tives of Mac's business associates in International Projector Corp. and in National Theatre Supply Co. The accompanying photographs mirror various phases of the evening's proceedings and the personalities identified therewith.

Mac's acknowledgment of the many

tributes accorded him during the evening so aptly expressed his philosophy of that which he strove through many years to accomplish and which won for him the friendship of thousands of projectionists in America, that it is recorded here for the entire craft to see:

"If I have accomplished anything in this field it is because I became convinced that 'Better Projection Pays', and that the projectionist is largely responsible for good projection.

"Over a long period of years I have tried rather persistently to make others feel the same way. Projection equipment is scientifically designed and precision built. Changes in any of the many products used in connection with the taking, making and showing of motion pictures will make the conscientious, competent craftsman in the projection room even more necessary.

"Similar ideas have been expressed before, but it does no harm to repeat them from time to time."

Indicative of Mac's widespread contacts in projection circles were congratulatory messages from Bill Canavan, former IA president, and Stanley Perry, chief projectionist at the Empire Theatre, London, England.

## Portentous Prophecies—Help Us!

Dr. Ralph Bienfang, University of Oklahoma: "Don't be surprised if the perfume advertisement in your daily newspaper some day smells fetchingly lovely, while on the next page the butcher's ad gives off with a steaky scent mingled with the odor of frying onions."

This recalls the abortive attempt of several "inventors" to invest certain motion picture sequences with specific odors indigenous to the character of the scene being shown. Fact! as several U. S. patent applications attest.

## NEWLY-ELECTED OFFICERS OF 25-30 CLUB OF NEW YORK ARE INSTALLED



Left to right: John Krulish (International Projector Corp.), trustee; Ed Dougherty (IA Local 384, Hudson County, N. J.), sergeant-at-arms; Morris Klapholz (Local 306), secretary; Al Kaye (Local 384), vice-president; Cecil R. Wood, Sr. (Local 306), president; and Ben Stern (Local 306), treasurer. All these officers will serve for one year.

# Condensers in Combination with Magnetic Coils

By A. BUCKLEY

IN CONNECTION with condensers, it is of interest to note here the term *potential difference*. The earth is assumed to be at zero potential, therefore any bodies having a different potential from earth will produce a movement of electrons to or from the earth. A negatively-charged body, i.e., one having a surplus of electrons, will, when connected to earth, lose its surplus electrons and assume the same potential as earth; oppositely, if a positively-charged body be connected to earth, there will be a movement of electrons to that body.

Figures 1 and 2 show just how these effects occur. Therefore, the relative potential of any charged spheres, plates, or even wires or cables, to earth is very often an important point.

Capacity can, of course, exist between any two bodies which are at a different potential. The capacities between parallel plates, wires, cables and outer sheath and inner conductor of metal-sheathed cables are often considerable, and the methods of determining such capacities are often most difficult to perform. Figs. 3 and 4 illustrate parallel wires and concentric cables, also the resultant effects.

## Electrostatic Screening

To minimize the unwanted effects of capacity between certain bodies, a method known as *electrostatic screening* is employed; thus two bodies which would normally produce an electric field can be prevented from doing so by means of an earthed metallic screen placed between them (Fig. 5). The basic action of screening is that the tubes of force do not exist between the screened bodies: they always terminate on the interposed metallic screen or screens.

The same general idea is used in magnetic screening of high frequencies where non-magnetic screens are used. The principle of action is that *eddy currents*, or small circulating currents, produce a magnetic field which is in opposition to the original field: this more or less cancels out the producing field. The idea works just like the back e.m.f. in a magnetic coil.

In low-frequency work, however, ferro-

magnetic screens are employed, since the magnetic substances readily conduct the crowded lines of force to ground or earth. Fig. 6 illustrates this idea.

## Inductive Reactance

Consider now the subject of *inductive reactance*. Here intrudes another form of reactance, that due to capacity (or capacitive reactance). This property is exactly opposite to inductive reactance in a physical sense and, in certain cases,



Above: FIG. 3.



Right: FIG. 4.



can completely neutralize it. The two properties can be likened to positive and negative signs in algebra, as for example:

$$+1 - 1 = 0; \quad -8 + 8 = 0$$

In other words, equal quantities of both forms of reactance cancel each other out.

Inductive reactance and resistance may be represented in the form of a triangle, with impedance measured upon the inclined line, or hypotenuse. The same thing, of course, applies to capacitive reactance, but since the two things are opposite in sense, the triangle must be drawn as in Fig. 7.

## Inductance and Capacity

Relative to both inductance and capacity we have mentioned the subject of frequency. Since frequency plays such an important part in simple and compound combinations of these properties, it seems necessary to get the whole matter straight at first. Here we make two statements, preliminary to complete explanations:

- The reactance of a magnetic coil *increases* with increase in frequency.
- The reactance of a condenser *decreases* with increase in frequency.

It is not always clear why inductive and capacitive reactances vary with a change in frequency, thus a few explanatory words would seem to be in order.

In the case of a magnetic coil through which a continuous current passes, so long as the current remains constant the

only losses in the coil are due to its resistance. If the value of the current be changed, then reactance occurs. The back e.m.f. mentioned in Lenz's Law\* is ever present, and whatever change takes place in the current values, that change is opposed by magnetic reaction. If the current changes be slow, the magnetic reactance is weak; and as the number of current changes increases in a given time, then the magnetic reactance also increases.

Remember (to give a mechanical analogy) a large flywheel can be caused to move to and fro at a very slow rate; but attempt to make it do so at a high rate, and it simply does not move.

Similarly, in a-c work, if the number of periods per second is low—say, 7—the magnetic reactance will be relatively low compared with that sustained at, say, a frequency of 1,000 c.p.s. As the frequency rises, the reactance of a magnetic coil becomes so great that it is necessary to either dispense with the iron core or use one of iron dust.

The inductance of a coil remains the same at any frequency, but a coil having a small inductance will have a low reactance at low frequencies and a high reactance at high frequencies.

## Sharply Contrasting Characteristics

Inductance and capacity are as opposite as the poles in characteristics. This observation is amply borne out by comparing the behaviour of coils and condensers at different frequencies. With a steady d-c there is also a sharp contrast in the behaviour of the two, for in a coil the only losses are resistive and the current continues to pass steadily.

In a condenser, however, after the full charging current has passed, the condenser acts as an *insulator*, i.e., no passage of current in the same direction

\* Lenz's Law states: "An induced current set up by the relative motion of a conductor and a magnetic field always flows in such a direction that it forms a magnetic field that opposes the motion."

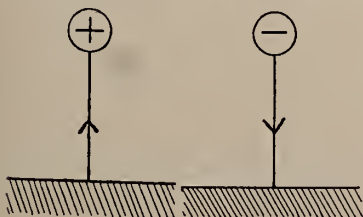
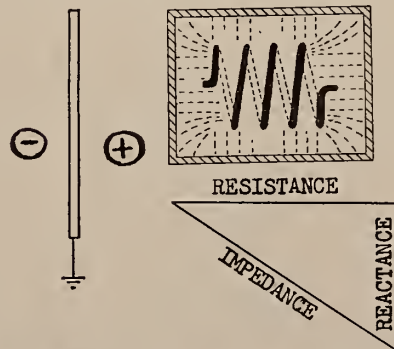


FIG. 1.

FIG. 2.



Above left: FIG. 5; upper right: FIG. 6; lower right: FIG. 7.

is possible: it has, therefore, an infinitely high opposition to current flow in that direction.

It was stated previously that a condenser possessed capacity; that capacity is virtually the same as that of a cistern, or an egg cup. When that capacity is reached—in the electrical or mechanical sense—no more of the essential substance can be admitted.

At low frequencies a certain value of condenser capacity will be charged in a fraction of a cycle, and the current will be dormant until it reverses direction. As the frequency rises, the dormant period becomes less and less until at one particular frequency the condenser will charge and discharge in more or less perfect time with each cycle. Above that frequency, the condenser will never be fully charged, since the period of the cycle is shorter than the natural charging period of the condenser.

The higher the frequency, the shorter the charging time, therefore there is no dormant period. According to this reasoning, at low frequencies the condenser is very much less efficient than at

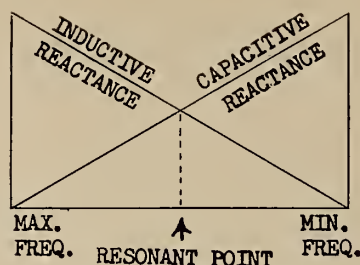


FIGURE 8.

a high level, so we say that as the frequency rises the capacitive reactance becomes less.

In the case of inductive reactance, frequency increase means an increase in the reactance; but in the case of capacitive reactance, frequency appears in the denominator of the fraction and, therefore, any increase in frequency will result in a decrease in reactance.

A numerical example will clarify this statement. If any whole number be multiplied by 10, that number will be increased 10 times. But if the denominator of an improper fraction be multiplied by 10, then the result will be 10 times

smaller, as in the following example:

$$10 \times 10 = 100 \quad 1 / (10 \times 10) = 100$$

Taking a rough example, if we draw two inclined lines showing the reactance of both magnetic coil and a condenser, as shown in Fig. 8, we shall find a point where the two lines intersect and where the two reactances are exactly equal. This is known as the *resonant point*.

The point of resonance varies, of course, according to the amount of reactance in both inductance coil and condenser: thus the resonant position of a small capacity and a large inductance might be exactly equal to a large capacity and a small inductance. The action may be likened to that of a clock where the hairspring corresponds to capacity, i.e., it has elasticity and is capable of storing energy—and the balance-wheel resembles a magnetic coil, virtually an electrical flywheel.

Now, a clock escapement will oscillate at one frequency provided the tension of the spring remains constant and that the temperature of the room does not

(Continued on page 29)

## Nine New American Standards Announced by the SMPE

**N**INE additional American Standards on Motion Pictures are published in the November, 1948, issue of the *SMPE Journal*, bringing to 49 the number of new and revised standards made available to the motion picture industry since January, 1946. At that time the American Standards Association, with the help of many SMPE and Motion Picture Research Council committees, embarked upon an expanded standards program calling for the review of all motion picture standards approved prior to the recent war and the reappraisal of all temporary war standards developed for the use of the military services during the intervening years.

A complete subject index of all 49 of these standards, contained in the SMPE Standards Binder (8½ x 11 inches) is available through the SMPE for \$8.50 postpaid within the U.S.A., or for \$9 in U.S. funds when mailed to a foreign country.

Among the nine new standards is one applicable to ASA dimensions for theatre projection screens. Details of this standard follow:

### 1. Scope and Purpose

1.1 This standard specifies dimensions for projection screens used for viewing motion pictures.

### 2. Screen Size

2.1 Sizes of screens shall be in accordance with Table A.

2.2 The over-all size shall be measured from the outer edge of border to the outer

edge of opposite border. The ratio of the over-all width to over-all height shall be 4 to 3.

### 3. Border

3.1 A fabric reinforcing border shall surround the screen. The width of this border shall be from 2.5 to 3 inches.

### 4. Grommets

4.1 Metal mounting grommets, size No. 3 or No. 4, shall be securely fastened through the fabric border.

4.2 Grommets shall be spaced on 6-inch

centers, starting from grommets located at the centers of the four sides of the screen, except that there shall also be a grommet in each corner of the screen. Grommets shall be set in a line parallel to the edge of the screen, with their centers from 1.0 to 1.31 inches inside the outer edge of the border.

### 5. Selection of Screen Size

5.1 The width of the screen should be not less than 1/6 of the distance from the center of the screen to the most remote seat.

5.2 The distance between the screen and the front row of seats should be not less than 0.87 foot for each foot of screen width

AMERICAN STANDARD DIMENSIONS FOR THEATRE PROJECTION SCREENS

Size No. of Screen	Over-all Width (feet)	Over-all Height (feet)	Minimum Effective Picture Size (feet)	
8	8.00	6.00	7.50	5.50
9	9.00	6.75	8.50	6.25
10	10.00	7.50	9.50	7.00
11	11.00	8.25	10.50	7.75
12	12.00	9.00	11.50	8.50
13	13.00	9.75	12.50	9.25
14	14.00	10.50	13.50	10.00
15	15.00	11.25	14.50	10.75
16	16.00	12.00	15.50	11.50
17	17.00	12.75	16.50	12.25
18	18.00	13.50	17.50	13.00
19	19.00	14.25	18.50	13.75
20	20.00	15.00	19.50	14.50
21	21.00	15.75	20.50	15.25
22	22.00	16.50	21.50	16.00
23	23.00	17.25	22.50	16.75
24	24.00	18.00	23.50	17.50
25	25.00	18.75	24.50	18.25
26	26.00	19.50	25.50	19.00
27	27.00	20.25	26.50	19.75
28	28.00	21.00	27.50	20.50
29	29.00	21.75	28.50	21.25
30	30.00	22.50	29.50	22.00

### NOTES:

1. Masking on each of the four sides of the screen is recommended as follows:

1 inch of masking within the projected picture area on each of the four sides of the picture for every 12 feet of picture width, with a minimum of 1 inch for pictures less than 12 feet in width.

2. Screens larger than Size No. 30 are not specified, as such screens are usually custom-built or not in 4 by 3 ratio due to projection angle.



# TELECASTS

## SMPE Theatre Television Group Lays it on the Line

**C**ONFIRMING that which has been stated repeatedly in IP, the Theatre Television Committee of the Society of Motion Picture Engineers has issued a 28-page printed booklet which, in outlining the present status of Tv, warns that the time remaining for the movie industry's participation in this new art is rapidly growing short and may soon be non-existent.

The report holds small comfort for those who hold that Tv is a "passing fancy" and will soon bear the same competitive relationship to film exhibition as does radio now; while it is nothing short of devastating to those who pin their hopes on the gregarious nature of humans.

Everything is ready for the wedding of the movie theatre and Tv arts, the report states, but it is stressed that "further development of equipment as well as provision by the FCC of suitable channels is now mainly dependent upon the interest shown by the motion picture industry."

### 'Experimental' License Status

The only transmission channels now held by the motion picture industry *per se* were those *experimental* allocations obtained through the efforts of the SMPE. Such allocations may be transferred into *commercial* licenses only if they are actively worked, and the lack of interest displayed by the movie industry to date seems to have convinced the FCC that no serious intent to use

these channels exists. In fact, in 1947 the FCC was on the verge of reallocating these channels to other services, a move which was prevented only by prompt and vigorous action by the SMPE.

It must be remembered that the SMPE report is concerned only with the application of Tv to the exhibition field, it being quite apparent that the Big Brass in filmdom are already moving toward delivering their studio properties to the Tv people whenever it suits their economic needs. Just where such a move would leave the theatres is anybody's guess, but there exists no rational person who couldn't see this development in the making.

### Summary of SMPE Views

Summed up, the SMPE report stresses the following points of the theatre-Tv situation as it now stands:

1. Everything is in readiness to go on the equipment and technique fronts.

2. Any further delay in applying for channel allocations—even a delay of approximately six months—may be fatal to the future well-being of the exhibition field.

3. All divisions of the motion picture field—production, distribution and exhibition—should unite on a common plan of action.

4. Large theatre circuits can have their own local or regional hookups.

5. Local events can be picked up by microwave relays.

6. A typical theatre installation costs about \$35,000, which figure could be reduced somewhat if sufficient orders were forthcoming.

7. Experimental licenses are obtainable, but *they must be used* to be retained.

One possible reason for the apathetic attitude displayed by the film industry toward Tv to date is contained in the following excerpt from the SMPE report:

"The general attitude seemed to be that it might be possible to buy into the television industry at some future date and thereby save the high cost of research and development." Bearing on this angle is the widely circulated report of recent weeks that 20 Century-Fox was seeking to buy control of American Broadcasting Co., formerly known as the Blue Network.

The complete report of the SMPE Theatre Television Committee will be published in IP as soon as formal release of the material can be obtained.

\* \* \*

Three possible courses of action in fighting the menace of Tv to the theatre box-office were canvassed by the recent convention of the Theatre Owners of America at Washington, D. C. Assigned to the Tv committee for further study were these proposals:

1. Apply to the FCC for special theatre Tv channels.

2. Apply individually for commercial Tv station licenses.

3. Rely upon distribution of Tv special-events coverage by coaxial cable or some other technic which may not require FCC approval.

Still to be mulled over in committee are the first two possibilities: whether the application for licenses shall be by the T.O.A. as a national organization, by local units thereof, or by circuit or independent theatre circuit operators.

Ready assent was forthcoming that no pickup of material from regular Tv network broadcasts may be made without payment of some sort to the owner thereof, provided the latter should extend permission, which is doubtful. Moreover, the vexing matter of required inclusion of all commercial plugs in such program fare still is far from a solution.

\* \* \*

**TELEVIEWS**—Hal Roach, famous feature and short-subject producer for many years, has forsaken film-making for theatres to devote his entire time to pictures for Tv use. . . . The FCC has ruled that Paramount Pictures does in fact exercise control over DuMont, therefore has denied former's application for  
(Continued on page 31)

### British Patent Is Issued On The Century 'C' and 'CC' Units

A British patent covering design features of the Century models C and CC projector mechanisms has been issued. U. S. patents on these units have been in effect for some time now. Prominent in the patent claims are higher shutter efficiency with less heat on the film; simplicity in gear and shaft design with practically 100% protection against failure due to bindups, frozen bearings, etc.; the elimination of lubrication problems by the use of sealed-for-life bearings, and the use of cushioned gears throughout to reduce noise levels and to eliminate vibration.

Featured also in the specs are manufacturing techniques for greater accuracy of the star and cam, together with the ground tooth placement of the intermittent sprocket with the new enlarged diameter (0.943").

### F-P Canadian Earnings Maintained

Earnings of Famous Players Canadian Corp. for 1948 will compare favorably with the record earnings of 1947, it is reported by President J. J. Fitzgibbons. Because no extra dividend was declared, company was able to add new theatres and modernize old ones without borrowing. F.P.C. now operates 375 theatres in 130 Canadian localities.

All 122 Fox Midwest theatres in Kansas, Illinois, Iowa and Missouri are now receiving RCA theatre service under a contract recently signed.



LEONARD A. EDWARDS—Vice-President, Associated Prudential Theatres, New York, N. Y.—says:

"We have used RCA Service continuously since 1929. It has never failed us."

To get the benefits of RCA Service—write: RCA SERVICE COMPANY, INC., Radio Corporation of America, Camden, New Jersey.

**PROJECTIONISTS'**  
**\$300** **SERVICE**  
**MANUAL**

## COLOR: ITS COMPLEX STRUCTURE

(Continued from page 17)

importance, *hue sensation* and *brightness*.

**Color in Hue:** The hue of a color is identified by its wave-length or its position relative to the spectral band of visible radiation, which reaches approximately from 400 to 700 millimicrons and, when thought of as a continuous band, must consist of an infinite number of different hues.

The human eye can at best distinguish about 200 hues, so that we may say that our eye can see a difference in two colors as long as the difference in their hue is not less than 1.5 millimicrons.

**Color Saturation:** This attribute of color is an indicator of its purity. A dye of spectral purity would have 100% saturation. White has zero saturation. The amount of dilution with white determines, therefore, the degree of saturation of any color of a given hue.

**Color Brightness:** Colors possessing identical hue and saturation may still differ in brightness. While hue and saturation are attributes which permit the qualitative determination and comparison of colors, brightness is a comparative quantitative characteristic of color, giving

expression to how a color affects our sensation as being more or less bright.

All three attributes—hue, saturation and brightness—are to be thought of as purely *mental* phenomena and not as *physical* characteristics. They are mental variables related to the variations in the physical stimulus caused by light of changing spectral composition entering the eye.

### General Comparison of Processes

Numerous methods have been devised and suggested, using either the additive or subtractive principle, to photographically obtain color reproductions. Of those actually in use at present for motion picture production, the subtractive method is practically favored to exclusion.

The additive process, while much simpler in processing and less complex in the synthesis phase, presents two obstacles which have, unfortunately, prevented its wider adoption for practical use. These are the necessity of having to use auxiliary optical elements in projection and the low light efficiency in projecting the prints through filters and superimposing devices.

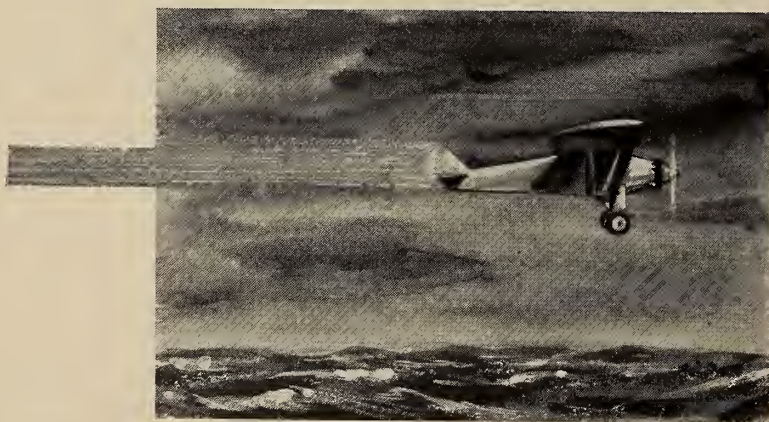
The comparative shortcomings of the subtractive processes are to be seen in the complexity of making superimposed color prints and in the fact that the complementary dyes required, particularly cyan and magenta, have so far not been produced with satisfactory selective transmission characteristics.

### Looks Forward to Standardization

The relentless efforts made in improving and simplifying the technique of photographic color processes for motion picture production will, no doubt, bring about a time when color photography is standardized to a degree comparable with present black-and-white photography. It offers, however, a relatively new and very large field to any progressive cine technician in the study of its psychophysical and psychological phases.

It is well conceivable that lack of understanding or of knowledge of psychophysical and psychological color phenomena may soon be recognized as a greater source of reproductive failures than the shortcomings traceable to purely physical phases of the specific color process used.

We see that color as a science has a rather complex structure. In being confronted with a complex problem, we may either react to it by throwing up our hands and turning our backs, or we may become fascinated. Either attitude is understandable and justified as long as one has his choice. It would seem to be the course of wisdom, however, for film technicians to be fascinated.



Since Lindy Put His Faith in the "Spirit of St. Louis."

**Projectionists**  
**have been**  
**putting their**  
**faith in**  
**NATIONAL**

For over 22 years we have been serving the men who "put on the show" by helping them keep it on.

When you think of equipment and supplies think of National ... we're as near as your telephone ... 24 hours a day!

"Everything  
for the Projection Room"



## SMPE PAPERS ABSTRACTS

(Continued from page 16)

picture photography. Five types of light sources might be used for this work, including incandescent sources, mercury lamps, fluorescent lamps, flash tubes, as well as photoflash lamps. Also explained is a new type of fluorescent lamp developed specifically for high-speed motion picture photography.

### ROTATING PRISM TYPE CAMERA

John H. Waddell

Bell Telephone Laboratories

A rotating prism type camera is one used for high-speed photography in which the image is refracted by parallel plane glass in synchronism with continuously moving film, thus avoiding intermittent operation and lens shutter problems. The many design problems necessary to produce a camera of this type are described, explaining the operation of the Fastax camera, capable of photographing as many as 10,000 images per second.

### NEW ADVANCES IN X-RAY MOVIES

C. M. Slack, L. F. Ehrke, C. T. Zavales,  
D. C. Dickson

Westinghouse Electric Corporation

Equipment has been developed for making X-ray motion pictures within exposure times of 10 microseconds and at frame rates from 50—150 per second. The extremely short exposure time permits the radiographing of very rapidly moving objects and the use of continuously moving film without blur in a specially constructed camera without a shutter. The short exposures are obtained by pulsing the X-ray tube in a circuit derived from radar technique.

The system may also be used in some cases to produce an image on a fluorescent screen which may be photographed on motion picture film with a camera such as the General Radio oscilloscope camera or a synchronized motion picture camera.

An outgrowth of the "Micronex" technique for making single radiographs with an exposure of 1 millionth of a second, the motion picture system has been developed primarily for the investigation of burning rocket propellants. It is expected that suitable adaptations may be made for a number of other problems.

### HIGH-SPEED PHOTOGRAPHY IN THE AUTOMOTIVE INDUSTRY

Richard O. Painter

General Motors Proving Ground

The methods of using high-speed photography in the automotive industry are described, together with application. Among the latter are door latch mechanisms, safety glass impact tests, shock absorbers, and the deflections of a tire striking an obstacle. Great savings in time and expense in developing new mechanisms are reported.

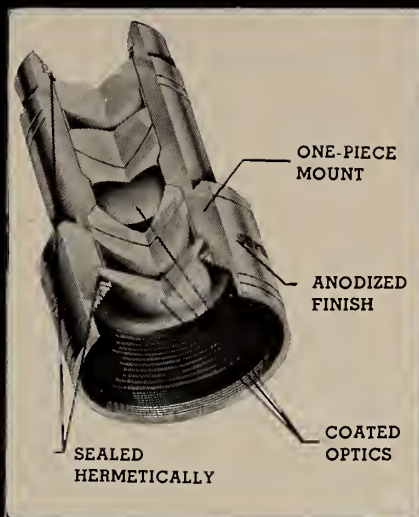
### PRODUCING A METALLIC SALT SOUND TRACK ON 16-MM ANSCO COLOR FILM

J. L. Forrest

Anso

In 16-mm Anso color motion picture film

## f/1.9 SUPER-SNAPLITE



Question  
Box

No. 1

### ARE THE LENS ELEMENTS COATED?

Yes, all glass-to-air surfaces (all surfaces except the cemented ones) are coated with a thin film of hard magnesium fluoride on Snaplite Series II and Super-Snaplite lenses.

### JUST WHAT DOES THIS COATING DO?

The coating decreases internal reflections and increases light transmission at each surface. By practically eliminating stray light, it improves contrast, brings out colors more fully, and increases the brightness of the picture.

### HOW MUCH BRIGHTER DOES THE LENS COATING MAKE THE PICTURE?

The coating increases light transmission about 4% per lens surface. Thus the Super-Snaplite having 8 coated glass-to-air surfaces transmits about 30% more light than would a similar lens with uncoated elements.

### WHAT CAUSES COATED LENSES TO BECOME CLOUDY?

The magnesium fluoride coating does not cause cloudiness, but might, because of its purple-straw color, make the cloudiness more apparent. Under the same conditions uncoated lenses will also have the deposit.

### WHAT IS THE DEPOSIT THAT FORMS ON LENS SURFACES?



This deposit may be dust, fumes from lamp housing or oil. Poor ventilation of the projector or projection room will probably cause a deposit to form on any glass surface in the projector or projection room.

"You Get the Most Uniform Light with Super-Snaplite"

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the silver is removed from the image, leaving dye in the three layers. The combination (maximum density) of the subtractive colors—cyan, magenta, and yellow—has a

visual density of about 3, which is sufficient to produce good screen contrast.

The maximum density, while being visually opaque, has a transmission band in the near infra-red in the region of 8000 A.U., which is the most sensitive region of the caesium type phototube. While for many purposes this may not be objectionable, it can be overcome by differentially processing the film so that the sound track modulations are opaque to red light without affecting the dye picture area.

This paper describes a method by which differential treatment of the sound track area can be accomplished.

#### HIGH-SPEED TELEPHOTO LENS

F. G. Back

Research and Development Laboratory

A high-speed telephoto lens F/1.3 for 16-mm and 8-mm motion picture cameras has been developed. The lens has a very high resolution, is corrected for longitudinal and transversal color, has no distortion and practically no field curvature. Its focal lengths are  $3\frac{1}{2}$ " and  $1\frac{1}{2}$ " respectively.

#### NEW SERIES OF 16-MM CAMERA LENSES

Rudolph Kingslake

Eastman Kodak Company

A matched series of six high-grade interchangeable lenses for 16-mm motion picture cameras has been developed. Focal lengths range from 15-mm to 152-mm, with relative apertures from f/1.4 to f/4.0, respectively. Reasons underlying the choice of formula for each lens are discussed.

#### IMPROVED SOUND REDUCTION PRINTER

C. W. Clutz and J. G. Streiffert

Eastman Kodak Company

While retaining the basic principles of the earlier Eastman sound reduction printers,

this new model incorporates significant improvements such as: a newly designed apochromatic objective system, a condenser system of increased efficiency, reduction of film wear by elimination of all stationary members in the film path, increased film capacity, torque motor take-ups, life-time lubrication of most bearings, pedestal mounting for greater convenience of operation, and complete operating controls conveniently located.

#### CO-ORDINATION OF 35-MM AND 16-MM SOUND-REPRODUCING CHARACTERISTICS

John K. Hilliard

Altec Lansing Corporation

This paper outlines how the 35-mm Standard Theatre Characteristic was arrived at, and how a derived 16-mm characteristic should be obtained. To arrive at the proper conclusion, it is necessary to review current recording practices.

#### PORTABLE MAGNETIC RECORDING SYSTEM

O. B. Gunby

RCA Victor Division

Progress and developments in synchronous magnetic recording are described, and some of the basic specifications which have been adopted are given, such as film speed of 90 feet per minute and widths of recording, playback, and erase heads. An earlier portable film recorder has been adapted to magnetic operation, permitting operation of film recording equipment in locations formerly inaccessible to work of this type.

#### LOW-COST 16-MM FILM PROJECTOR

Franz G. Talley

Connecticut Telephone & Electric Company

A new lightweight 16-mm motion picture projector was evolved to provide quality operation at low cost. Among the design features are the elimination of precision tolerances other than in highly critical areas, individual unit design which permits assembly by relatively unskilled operators, and reduction of the overall number of component parts. Unit construction also simplifies the problem of repair. A demonstration of SMPE Test Film Z-522 was presented on this projector.

#### ADVANCES IN CADMIUM-MERCURY LAMPS

E. W. Beggs

Westinghouse Electric Corp.

The short arc lamp design increases brightness and provides a compact source of light for both spot and flood operation in one simple projector. With a minimum use of filters, a cadmium-mercury combination provides color correction suitable for three-color photography. Mercury vapor-discharge lamps are practical for projection of black-and-white but are not yet suitable for color. Such lamps, however, are now used to reduce heat problems in television production.

Intermittent gas arcs and continuous discharge through krypton gas are not yet commercially practical for studios. The high spectrum quality and blue-white color of the krypton arc is held to justify further development.

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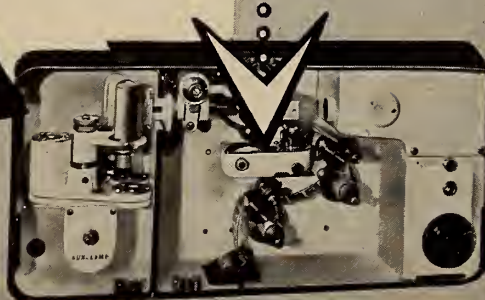
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**CENTURY PROJECTOR CORP.**

New York, N. Y.



The Award-winning Hydro Flutter Suppressor as used in the new Century sound reproducer.



Century Sound Reproducer

## CONDENSERS AND COILS

(Continued from page 24)

alter; likewise, a given combination of inductance and capacity will oscillate only at one frequency.

Current in a purely inductive circuit will lag one-quarter ( $\frac{1}{4}$ ) of a cycle ahead of the voltage. The reason for this is that an uncharged condenser has *no impedance*, and, therefore, a heavy initial current will produce no voltage across it. When the condenser is fully charged its impedance is infinitely great and there is no current passing: at this stage a voltage exists across it.

A condenser, therefore, just upsets the relationship between the voltage and current in an a-c circuit as much as a magnetic coil does, only where one delays the current, the other actually advances

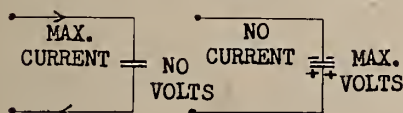


FIG. 9.

FIG. 10.

it. Figs. 9 and 10 show that when current is a minimum the voltage is a maximum, and *vice-versa*.

A simple series circuit embodying a coil and condenser is shown in Fig. 11. This is known as an *acceptor circuit*. Here the current existing within the coil and condenser will be the same. However, the voltages in both the coil and condenser will be out of phase with the current—the coil volts will be one-quarter ( $\frac{1}{4}$ ) of a cycle ahead of the current, and the condenser volts will be one-quarter ( $\frac{1}{4}$ ) of a cycle late—therefore, the two are diametrically opposed.

This arrangement is used in radio receivers and may be tuned to accept a certain frequency by adjustment of the capacity of the condenser.

A parallel circuit of inductance and capacity is shown in Fig. 12. Here a rather different state of affairs exists, for the voltages across both coils must be the same: therefore any out-of-phase condition must be in the respective currents in the coil and condenser. This is a *rejector circuit*, and can be tuned to a certain frequency just like the acceptor arrangement; but whereas the acceptor

passes one frequency only, the rejector passes all others and rejects the tuned frequency.

The principles of acceptor and rejector circuits are exceedingly interesting, particularly to those having some interest in radio communication. Why should one circuit offer an easy path to one frequency, rejecting all others, while the other acts as a high impedance to one frequency and offers little opposition to any others?

Well, examining Fig. 11, a simple acceptor circuit, we see that since any currents intending to get through the arrangement must pass through both coil

and condenser, and as these are tuned to one frequency only, obviously that frequency alone will cause the coil and condenser to oscillate in sympathy. Any other frequency will be "off the beat," as it were, and will be unable to force its way through.

In Fig. 12 the rejector circuit operates quite oppositely in every way, for since alternative paths are present—through either the coil or the condenser—frequencies other than the tuned one can get through all right; but the tuned frequencies oscillate *inside* the closed circuit and do not dissipate themselves across the full outer circuit.

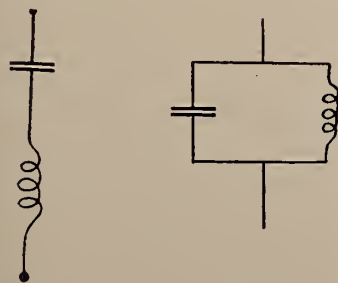


FIG. 11

FIG. 12.

## THE STRONG TROUPER

*Portable High Intensity*  
A. C. CARBON ARC SPOTLIGHT



for theatres, auditoriums and night clubs where the length of throw does not exceed 100 feet.

PRODUCING A SNOW WHITE uniformly illuminated spot, crisp on the edges, the Troupers will supply that essential sparkle to a presentation that is obtainable only with the use of high intensity arcs.

FAR SURPASSING IN BRILLIANCY of spot any incandescent or vertical arc type spotlight, the Troupers will actually equal many of the large theatre type spotlights.

ENGINEERED WITH AN EYE toward simplicity and ease of operation, this spotlight is capable of being easily operated by a "new" man on "opening night".

THE OPTICAL SYSTEM utilizes a silvered glass reflector to collect the illumination from the source and direct it to a circular aperture, from where it is projected to the stage by means of a two element variable focal length lens system.

FOR A 60-FOOT LENGTH OF THROW, the size of the projected spot is variable from a minimum of 30 inches "head spot" to a maximum of 33 feet "flood".

EXTREMELY MODEST IN ITS POWER requirements, this spotlight draws only 10 amperes

from any alternating current 110-volt convenience outlet.

A HIGHLY EFFICIENT, adjustable and self-regulating transformer which is an integral part of the spotlight base reduces the 110-volt alternating current supply to a low arc voltage and for the first time makes possible a high intensity arc spotlight without the use of heavy rotating equipment.

THE CARBONS ARE FED AUTOMATICALLY by an electric motor which maintains a constant arc gap. This results in a steady light, free from hiss or flicker.

A TRIM OF CARBON consists of two 6mm x 7" heavy copper coated high intensity carbons with a burning time of one hour and twenty minutes at 21 volts and 45 amperes arc current.

A HORIZONTAL MASKING CONTROL can be angled at 45 degrees in each direction from horizontal.

THE COLOR BOOMERANG contains six slides and an ultraviolet filter holder.

MOUNTED on casters. Easily disassembled into two units for shipment.

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—Manager of Fairmount Theatre,  
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"Our regular RCA Service has been the reason behind more than six years of trouble-free sound reproduction."

To get the benefits of RCA Service—write: RCA SERVICE COMPANY INC., Radio Corporation of America, Camden, New Jersey.

## STABILITY vs. CHAOS IN Tv

(Continued from page 18)

niques (such as special forms of satellite or peripheral stations), new types of transmitting and receiving antennas, new designs of receiver components and assemblies, and careful and extensive field tests.

The engineers should be encouraged to carry forward experimental research along such lines. But this does not mean that their ideas should be accepted until thoroughly completed and field-tested. Nor should they even be publicized until that point of definite proof of their usefulness has been reached. Above all, such untried ideas should not become the subject of long and sometimes unhelpful hearings in Washington.

### Shun Too Easy Acceptance

Consider what might happen in a great hospital if every new drug or remedy which was brought to its superintendent was given unlimited publicity and was at

once tried on all available and unhappy patients. Some miraculous cures might occur; on the other hand, the neighboring undertakers would undoubtedly be overworked.

Medical men properly insist on long and careful clinical tests of every proposed remedy before it is approved for general practice. Indeed, publicity by ethical physicians, dealing with new medical materials, always properly emphasizes the experimental nature and the incomplete information available for such material. In some instances it has been found that while apparent cures could be accomplished by some remedies, the secondary results at a later date were fatal.

This lesson should be taken to heart by all who are involved in television development—engineers, manufacturers, broadcasters, governmental officials, and editors.

It is easy enough to make startling and sensational proposals. How delightful it would be to use 1000-kilowatt transmitters on 10,000 mc. to send out glorious three-dimensional, high-detail, color pictures accompanied by three-dimensional sound. How delightful—and how utterly impracticable and premature!

### Suggests a Moratorium

It is time for the television industry and its regulators seriously to call a halt on continuous suggestions for untested changes. Let us have a moratorium on changes every few months on the basis of a bright idea which has not been thoroughly worked out in the laboratory, adequately tested in the field, searchingly investigated as to its likely consequences, and studied as to its economics. Let us benefit from the English decision to crystallize television practices for a number of years.

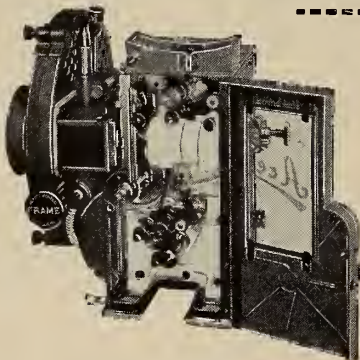
Let us take to heart the lesson of clinical tests, as practiced in medicine. Medicine deals with the life and death of individuals. Television engineers deal with the success or failure of a great industry, and of the service to the public which it can render.

### 'Sound Track' Compendium Ready Now

Ready now is "The Sound Track Book of the Theatre," a compendium of articles which have appeared over a period of several years in the magazine of the same name which is distributed at intervals by Motiograph, Inc. The volume—6 x 9 inches, having more than 450 pages and 300 illustrations—constitutes an encyclopedia of motion picture theatre activity, from management down through projection.

The articles are accurate and authoritative and are so written as to be perfectly intelligible even to the novice in theatre work. The technical articles covering equipment and technique have been pointed directly at the projectionist. Priced at \$10, the volume is available from "The Sound Track" at 1001 Washington Blvd., Chicago, 7.

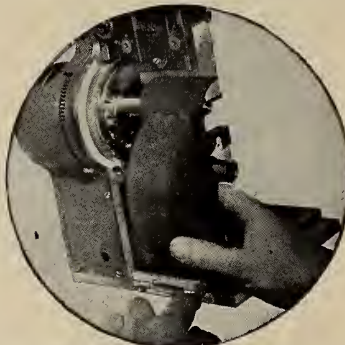
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You are assured of "Smooth-Running" performance with the Wenzel time-proven projector. Use Wenzel's precision replacement parts . . . and your present equipment will do a smoother-running job.

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## NEW MOTIOGRAPH-HALL LAMP

(Continued from page 19)

power fluctuations occur, the control equipment varies the arc gap for optimum operation.

The moving portions of the M-H lamp consist of comparatively few parts, all of which are precisely machined and extremely wear-resistant. The arc burner mechanism is of unit construction, permitting quick and easy removal if servicing be required. The housing is roomy, well ventilated and has a false bottom for the entire length of the burner mechanism to facilitate cleaning.

### Close Attention to Details

Positive carbon contacts are made of bronze, which has the best heat conductivity consistent with resistance to oxidation and scaling. The contact surfaces are lined with pure silver 1/16th inch thick. These materials readily conduct current and carry away the heat, yet they will not scale.

No ammeter is included on the M-H lamp, Motiograph holding to the theory that electrical current indicating instruments are so delicate as to have their accuracy impaired by continued exposure to high temperatures, vibration and strong magnetic currents. It is suggested that the best location for such instruments is on the front wall of the projection room.

More detailed information anent this new M-H lamp is through any Motiograph dealer or by writing direct to the factory.

## IP TELECASTS

(Continued from page 25)

Tv outlets in San Francisco, Detroit and Boston, and the latter's bid for stations in Cleveland and Cincinnati. Paramount will appeal the decision.

Recent survey by Audience Research shows that movie attendance of Tv set owners is 25% below that of non-owners. On day before interview 69% of set owners watched Tv, while 8% of non-owners did likewise in someone else's home or in public places. In response to query "Do you attend the movies less frequently than before you had a Tv set?" the results were as follows: less frequently, 53%; about the same, 46%; more frequently, 1%.

Tv, radio and even newspapers have scooped the newsreels so consistently as to occasion a drastic cut in newsreel theatre receipts. Trans-Lux Theatres, reporting a 50% decline at the box-office of two theatres, and at least a 20% drop in all others, recently switched several houses to feature-film showings. Decision on remaining newsreel spots will be forthcoming shortly.

Philadelphia on Jan. 1 started collect-

ing a 5% tax on the gross receipts of taverns having Tv receivers. The move followed litigation by which the State Liquor Control established its right to require bars with Tv to obtain amusement permits. . . . Paramount's KTLA Tv outlet in Los Angeles will inaugurate a tele-transcription service for theatres and other Tv stations on the West Coast, beginning Jan. 15. System will be a duplicate of the one now in use at Paramount

Theatre, N. Y. City. Similar setup is planned for Par's Chicago outlet.

The Home of Swat and Slug, Madison Square Garden in N. Y., delivered a body blow to those exponents of the "gregarious" theory with respect to Tv when it announced serious consideration of abandoning its Tv contracts when they expire next May 31. The Garden figures Tv is sloughing its box-office. Tv-theatre marriage brokers please note.

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STAR CORE, exclusive feature with the Lorraine Carbons — a manufacturing process that increases the performance of the carbons.

A more brilliant, steadier, more consistent white light—more economically . . . proven facts as shown by tests made under actually operating conditions.

Lorraine Carbons are world renowned . . . the largest theatres in the U. S. and throughout the world use Lorraine Carbons.


\*Featured in our horizontal-feed copper-coated carbons.

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"RCA Service has been our Silent Partner over the years, in carrying on the slogan, 'The Show Must Go On.'"

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PATCH FILM  
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Available in 1 and 8 oz. bottles and 16 oz. cans. Follow the lead of projectionists in countless theaters who are already PERMANENTLY patching film with FILM-WELD.

Projectionists favorites also are ZIPPER CHANGEOVERS to guarantee continuous performance; Strong Universal Rewind Mules, the fool-proof "mule" that fits any enclosed rewind; and Strong Reel-End Signals.

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## PERSONNEL

CLYDE R. KEITH, New York engineering representative for the ERPI division of Western Electric, has just concluded a tour of the studio sound recording departments in Hollywood and has returned East.

HENRY M. FISHER, until recently manager of DeVry Corp.'s New York division, as well as the firm's liaison representative in Washington, has been named vice-president in charge of sales and merchandising with headquarters in Chicago.

With DeVry for more than 20 years, FISHER has had wide experience in engi-

neering, sales and distribution activities in the theatrical, educational, industrial, religious and home movie fields.

Ampro Corp., of Chicago, has announced two promotions of key men: HOWARD MARX has been upped from assistant sales manager to vice-president and general sales manager. FRANK B. ROGERS, JR., eastern division manager, has also been named a vice-president and assistant sales manager.

Both men have had extensive experience in all phases of the audio-visual field and have compiled imposing performance records.

BERTEL K. W. BUDTZ, 46, southeastern Caribbean manager for Western Electric, died suddenly of a thrombosis on December 14 at his home in Port-of-Spain, Trinidad. He had just returned from the managers conference sponsored by Westrex Corp. in New York last November.

H. B. (Bob) ENGEL, one of the most popular and widely known men in the motion picture equipment field, has been appointed general sales manager for GoldE Mfg. Co., of Chicago. For more than 30 years Engel has been associated with the theatre field, his most recent post being general sales manager for DeVry Corp.

J. H. McNABB, 61, since 1922 president of Bell & Howell Co. of Chicago, died on Jan. 5. McNABB was given much of the credit for the expansion of B. & H. business through the years to the present figure of \$22 millions annually.

DR. A. H. PFUND, 69, Professor Emeritus of Physics at Johns Hopkins University, died on Jan. 6. Noted for his work with light, Dr. PFUND developed an instrument which measured the heat of a candle 18 miles away, and he also discovered a foolproof method of testing precious stones through their infra-red reflections. He was credited with developing the "gold-colored glasses," which are transparent yet eliminate heat and glare from light and are used mostly by people working near furnaces. He was a former president of the American Optical Society.

L. W. TEEGARDEN has been named vice president of the RCA Victor Division of RCA in charge of all technical products, including theatre motion picture equipment.

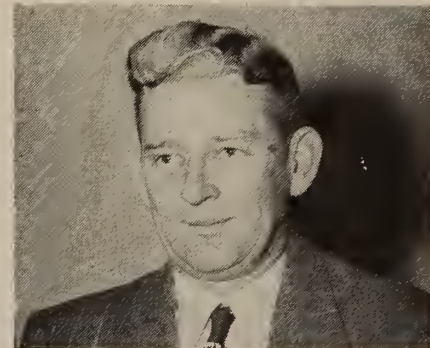
THOMAS L. MCCLEARY, salesman in the

Theatre Equipment Sales Section of RCA in the Cleveland territory, has gained the Annual Award of Merit given by RCA for conspicuous effort.

A. G. BERG, field service engineer for RCA Service Co. for the past five years, has been named regional 16-mm sales representative in the Dallas area with offices at 1907 McKinney Ave.

OREST J. FOREST, has been appointed manager of the Trinidad branch of Western Electric Co. (Caribbean), replacing the late BERTEL K. BUDTZ. Climatic changes evidently affect FOREST not at all, for he received his E.E. degree at Harbin Polytechnical Institute in Manchuria.

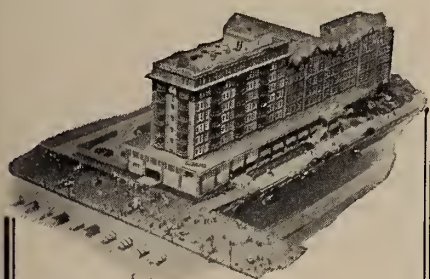
Fifty years ago Kodak had only one type of negative plate and one type of photographic paper—which was printed by sunlight. Today the company produces more than 75 types of film support coated with 200 kinds of light-sensitive emulsions. Photographic chemicals go out in 430 different packages, while sensitized paper is shipped in 20,000 varieties of packages.



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## Presenting: David E. Day, Chicago Local 110

**N**OT many of today's active projectionists remember a projection setup which utilized 50-mm film (2 inches wide) and limelight, nor the epochal Edison film "The Great Train Robbery." Yet that was the combination that launched David E. Day, member of Chicago Local 110, on the show business trail. In 1906 Davy worked in the first nickelodeon in Chicago's Loop, where the famous Palmer House stands today.

Envisaging big—but *big*—things, Davy once signed on as a cameraman to shoot pictures of the Miller Brothers 101 Ranch rodeo in Oklahoma. After shoot-



Davy  
Day

ing 8,000 feet of film the party returned in high spirits to the lab in Chicago. But no pictures. Someone had left a cap over the lens! "Fired" was the word for Davy.

Followed various theatre projection chores, not all of which were routine. For example, there was the White City setup where the booth (and we mean *booth*) was directly over the ticket cage. One day Davy was suddenly precipitated into the cashier's lap. Nobody believed his denial of having weakened the booth's supporting beams in the dead of the preceding night.

Old-timers will remember the penchant of ye olden projectionist to crane his neck out of the extremely narrow portholes which then were in vogue. Well, they can relish the mental picture of Davy Day getting his head out just a bit too far in one of these slits and having to wait patiently in that position until the manager could arrange to have the framework cut away and thus release the impetuous rubberneck. Davy was really giving a show that day—in competition with the screen image.

Most projection mugs have a hobby or two tucked away, some of them sur-

reptitiously. Davy makes no secret of his, however, particularly when in 1933 he built an amateur radio station and contacted many projectionists through stations W9PEH and W9TIC. The guy must have something mechanically, because he is the inventor, but the *very first*, of a plastic coin holder.

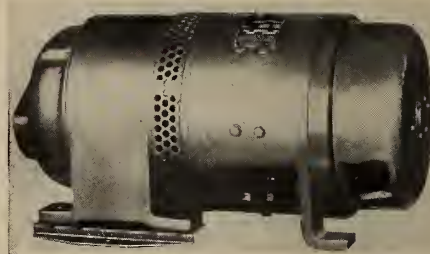
Latterly, Davy has turned nussmismatist (coin collector to you) and he reports that the hobby is both fascinating and profitable. Sort of a being-paid-for-fun setup.

A charter member of Local 110 and an officer for more than 20 years therein, Davy has worked at the Commercial Theatre for the past 28 years. He now feels that he has contributed substantially both to his Local and to his job, so now he hies himself away to Florida from Nov. 15 to May 1 each year.

Pretty soft may say thee; but when a guy has slugged it out all along the line since 1906, there's nothing to be had anywhere, including Florida, that he hasn't earned the hard way. Davy says that his experiences in the craft must shape up as a sort of taffy by comparison with those of other old-timers, and he would like to hear from this gang.

### Improvements in Transverters Are Announced by Hertner

Improvements have been effected in several models of Transverter motor generator sets manufactured by The Hertner Electric Co. Design changes have markedly improved the appearance, as may be seen by the accompanying photo, with streamlining having been achieved through the use of a new



Hertner Transverter Type HI 70-140.

commutator cover and an aluminum alloy motor frame design.

New model Transverters utilize "sealed-for-life" ball bearings which obviate the necessity for periodic greasing with the consequent danger of over-greasing. This feature will, among other things, eliminate the danger of grease getting onto the commutator and causing grooving and other difficulties. A new larger conduit box for the generator has been made standard to provide more space for making the electrical connections.

Full details relative to all Transverter models are available from Hertner at 12,690 Elmwood Ave., N. W., Cleveland 11, Ohio.

### Silver Alloy Magnets' Longer 'Reach'

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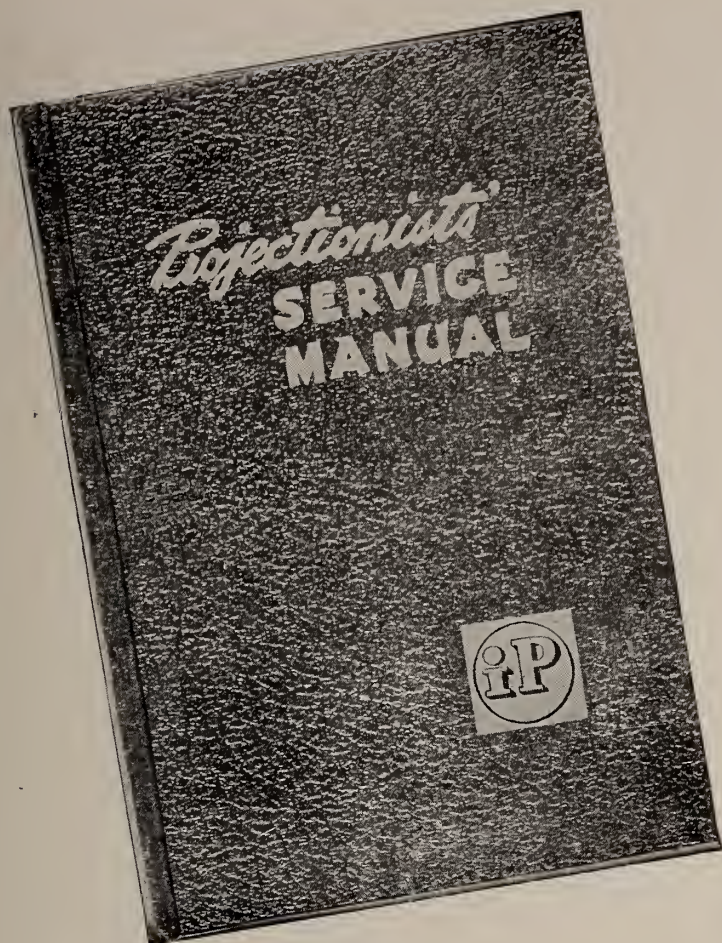
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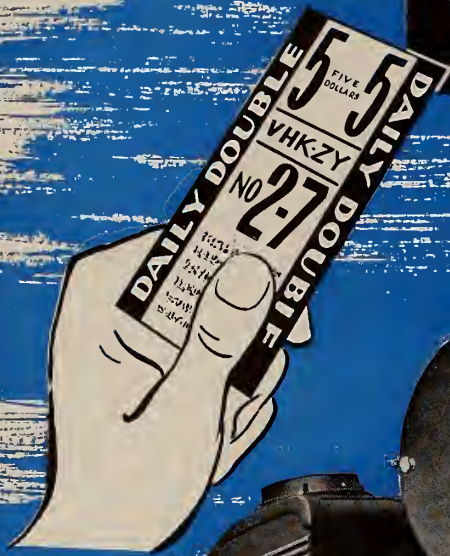
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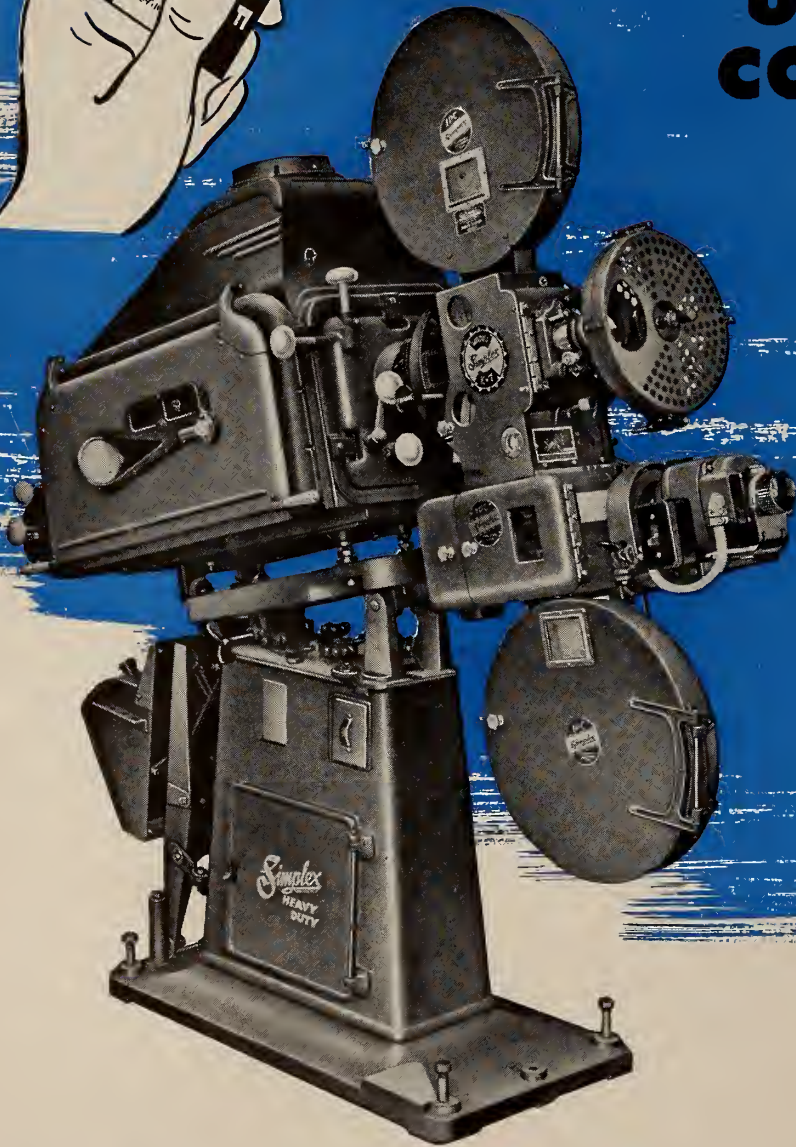
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# Western Electric's "300" Recording System Gets Rugged Workout in Venezuela

Faced with the problem of making films on location in the mountainous terrain of Venezuela, The Princeton Film Center, Princeton, N. J., is using a Type 300 Recording System mounted in a small truck.

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The Princeton Film Center recordist at the mixer of the "300" System on location high in the Venezuelan mountains.



This small truck contains the complete "300" Recording System, plus all the power generating equipment needed on location.

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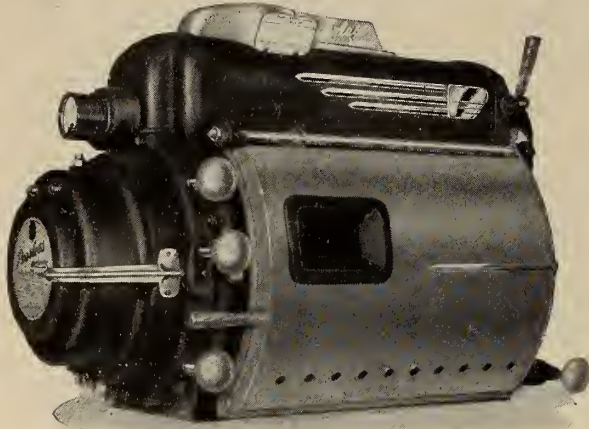
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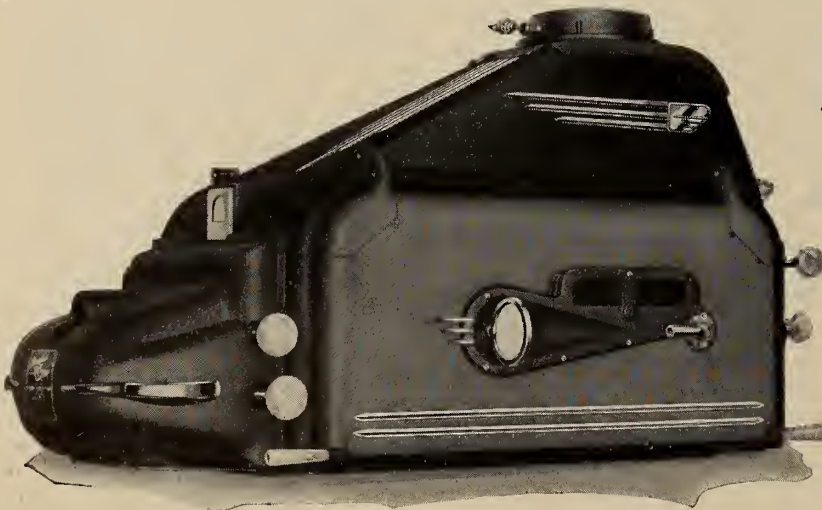
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HENRY B. SELLWOOD, *Editor*

Volume 24

MARCH 1949

Number 3

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## MONTHLY CHAT

THE very able R. H. Cricks, technical editor of the British journal *Ideal Kinema*, observes that British projectors have been "paid the highest possible compliment" by the publication recently in IP of descriptions of the British-made Kalee GK 21 and B.T.H. Supa mechanisms. Mr. Cricks also notes the IP statement that "American motion picture equipment no longer dominates the world market". Mr. Cricks continues:

"I am the last to decry American projectors: of the Simplex, the only American machine widely used in this country, I can conscientiously say that it is the only machine of which I have never heard of mechanical trouble. Nevertheless, my view as an engineer is that British projection equipment is years ahead of American design."

British superiority, opines Mr. Cricks, is due to the fact that "for the first time we have an outfit designed from the ground up as an integral unit, capable of doing everything that is demanded of a modern sound projector". Now, Mr. Cricks will concede that at least four American projectors—Brenkert, Century, Motiograph, and Simplex—accomplish precisely the same thing, not only in America but in far-flung corners of the world which never see a serviceman. Tasting is in the eating.

Anent the "modernity" of these new British projector designs, we submit the following comment by a British technician of vast experience in projection matters in and outside Great Britain:

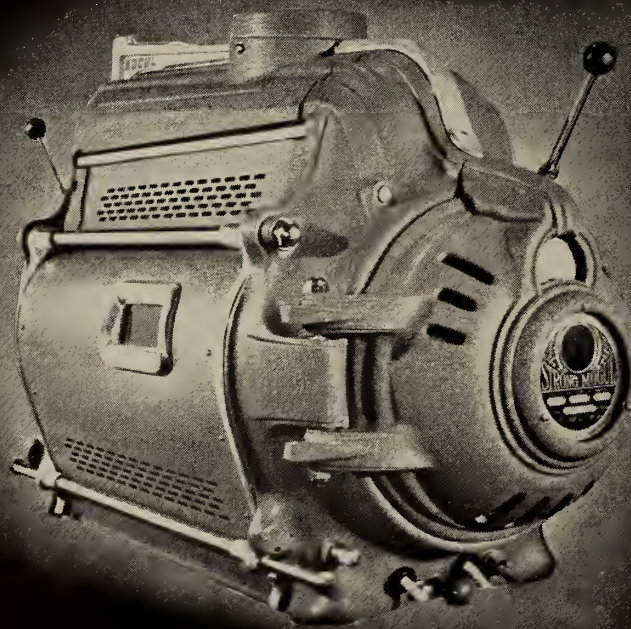
"I fully agree with remarks in 'Monthly Chat' in IP for December last. I should dearly like to write an article debunking these British projectors of recent design, but obviously I cannot. I'm all for standardization of equipment, thus I think that stuff like the SUPA is completely retrograde.

"Any exhibitor who is kidded into buying one of these outfits is completely tied to one firm for many years to come. From the projectionist's viewpoint, such apparatus mean that he has either got to be a superserviceman to maintain it, or he must be a brainless coot.

"The Kalee 21 isn't quite so unorthodox a design, but here again the buyer is tied down to one supplier for any future development. I can understand and appreciate the utility of a streamlined aircraft, automobile or railroad locomotive, but I'm darned if I can see the sense of a streamlined projector. And streamlining is about the only 'modern' aspect of these mechanisms."

IP is pretty much in agreement with this observation; and the need for constant servicing of British projectors has been stressed by our Canadian friends who operate these mechanisms.

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## This 'Matching' of Projection Optics

THE vexing matter of matching projector optical elements has evoked sharper differences of "expert" opinion than any other topic in modern projection technology. Everyone agrees that screen results are best when the projection lens is optically matched to the lamp condensing system, but beyond this simple concession all is confusion and misconceptions abound.

This bewildering state of affairs appears to be due in part to uncertain and conflicting ideas of what constitutes a state of perfect optical balance in a motion picture projector. Failure to agree on a definition of the term "matched optics" has been lamented by optical technicians.<sup>1</sup>

The fact that acknowledged authorities disagree on so fundamental a matter imposes an undeserved handicap upon the projectionist who daily assumes responsibility for the performance of projector optical trains. Little benefit will result from academic discussions of matched optics until the individual pro-

By ROBERT A. MITCHELL

jectionist knows beyond all doubt how the equipment in *his own projection room* measures up against the criterion of optimum matching conditions.

### Definition of Terms

What exactly is meant by a condition of perfectly matched projector optics? We can settle this matter definitely only by considering what happens to the light as it passes through the projector optical train.

It is commonly supposed that the optical speed of the lens should be the same as the rated speed of the lamp mirror or condenser to insure a condition of "match" between these two elements. If we consider the aperture as a mere *point*—a very small pinhole, let us say—this theory appears to be true, as demonstrated by Fig. 1. Lines drawn from the edges of the mirror are intercepted at the edges of the lens and no light is presumably wasted. In this dia-

gram the projection lens is represented by a single element for the sake of clarity.

This theory is very attractive because it is so very simple. How shocked we shall be if more careful consideration shows it to be false!

What about that "pinhole aperture"? A projector aperture is not a mathematical point, so why should it be considered as one? An aperture is an *area* which compares favorably with the area of the lens opening. The light rays from the lamp must cover the entire aperture, hence they impinge upon the lens surface from many different directions. Yes, we are forced to conclude that the simple theory fails to represent the conditions existing in a projector optical train. Fig. 1 is not only inapplicable to the problem of projection optics, but is actually misleading!

Let us replace Fig. 1 by another diagram (Fig. 2) in which two "point apertures" are used, the distance between the points being the same as the diagonal of a 35-mm projector aperture

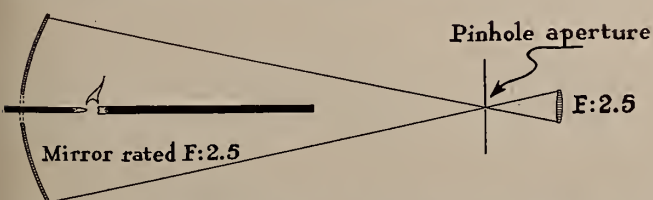


FIG. 1. An F:2.5 lens "matched" to an F:2.5 mirror—in theory, but not as conditions exist in an actual projector.

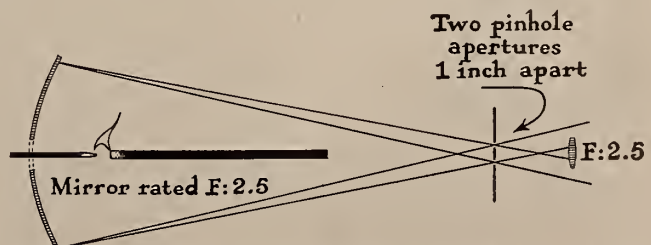


FIG. 2. Showing actual optical conditions in a projector. Note that an F:2.5 lens does not match an F:2.5 mirror. A large proportion of the light from the illuminated aperture is lost.

—approximately 1 inch. Here again an artificial device is employed, for no projector aperture consists of two pinholes. But this course is justified because the points define the maximum limits of a real aperture and accordingly define the dimensions and “spread” of the light beam emerging from a real aperture.

Now examine Fig. 2. It employs the same mirror-lens combination used in Fig. 1. Would you say that the lens matches the mirror in this case? Of course not. The  $F:2.5$  lens fails conspicuously to intercept all of the light emerging from the two pinhole apertures in Fig. 2. A more rapid (larger) lens must be used if we are to obtain an optical match.

If now we replace the two-pinhole scheme by an actual aperture<sup>2</sup> and view the light beam perpendicularly to the diagonal of the aperture, we shall obtain visible proof that Fig. 2 represents perfectly the outermost boundaries of the flood of intense light pouring from the aperture.

#### Basis for the Definition

Now for that much-needed definition. Fig. 2 will help us see what is really meant by “matched optics”. If the lens in Fig. 2 were larger—say, just large enough to touch the outermost light rays—no light would be wasted, all of it being brought to a focus on the screen. Is it not obvious that if the lens is just large enough to catch all of the light coming from the aperture—not a bit too large or too small—we could in all truth say that the lens *exactly* matches the lamp optics? If we agree to this, our definition practically writes itself.

A state of optical match between projector lens and lamp optics exists when the lens has sufficient “speed” to intercept and utilize all of the light emerging from the aperture.

This optical condition is the most efficient possible, and hence may be expected to provide maximum picture brightness and uniformity of illumination.

The implications of this definition require us to investigate certain features of projection optics. We have yet to work out a method of finding the lens speeds which match given lamp condensing systems.

The optical speeds of lenses are indicated by  $F$ -numbers. An  $F$ -number is simply focal length divided by clear diameter. If a projection lens has an equivalent focus of  $4\frac{1}{2}$  inches and a clear opening of 2.37 inches, its speed rating is  $F: 4.5/2.37$ , or  $F:1.9$  (very

<sup>2</sup>The dimensions of the 35-mm soundfilm aperture are .825 by .600 inch. The diagonal of a square-cornered aperture is  $1".0406$ ; of a round-cornered aperture,  $1".0107$ , when the corners are curves of radius  $0".047$ .

nearly). The lower the  $F$ -number, the more rapid and efficient the lens: an  $F:2.0$  lens is “faster” than an  $F:2.5$  lens.

By all appearances, the speeds of lamp mirrors and condensers are expressed by the same system of  $F$ -numbers. Such, however, is not the case, though many projectionists seem to be unaware of this fact. This is not surprising, however, for lamp manufacturers have ever flaunted the spurious  $F$ -number ratings of their condensing systems as indications of optical speed.

#### Genesis of $F$ -Number

The  $F$ -numbers commonly assigned to lamp mirrors are obtained by dividing the working distance by the diameter of the mirror. (Working distance is the distance from the center of the mirror to the center of the aperture.) Thus, a 10-inch mirror placed 25 inches from the aperture is rated  $F: 25/10$ , or  $F:2.5$ . Lamp manufacturers usually choose a working distance at which the image of the positive crater on the aperture is just about large enough to fill the entire rectangular opening with even illumination.

It may be argued that better screen results could be obtained by shortening the working distance a trifle below manufacturers’ recommendations, but to do so would arouse a storm of protest from makers of mirrors and lamps. The writer emphasizes the *arbitrariness* of assigned working distances; he makes no argument whatever concerning them.

The true  $F$ -numbers of lamp condensing elements must be distinguished from the spurious ones. The true  $F$ -number ratings show that modern projection lamps are very much “faster” than is commonly supposed. They may be found by the same rule which determines projection lens  $F$ -numbers, namely, focus divided by diameter.

The true focal length of a mirror or condenser, however, is neither the working distance nor the “geometric focus” (distance from the crater of the positive carbon to the center of the condensing element). The following formula gives a very good indication of true focus when

geometric focus and working distance are known:

$$\text{True focal length} = \frac{\text{Geom. focus} \times \text{Working dist.}}{\text{Geom. focus} + \text{Working dist.}}$$

$$\text{Geom. focus} + \text{Working dist.}$$

Here is why the spurious  $F$ -numbers of lamp condensing elements are at best only imperfect indications of optical efficiency. Manufacturer Jones builds a lamp using a 10-inch mirror which provides optimum results (a satisfactory image of the positive crater on the aperture) when a working distance of 25 inches is employed. The crater image is formed when the positive carbon crater is 6 inches from the center of the mirror, the geometric focus.

The spurious rating of this mirror, the  $F$ -number Jones will assign to it, is  $F: 25/10$ , or  $F:2.5$ . The actual optical speed of the mirror is:

$$\begin{aligned} &6 \times 25 \\ (1) \text{ True focus} &= \frac{\quad}{6 + 25} = 4.84 \text{ in.} \\ &4.84 \\ (2) \text{ True speed} &= \frac{\quad}{10} = F:0.484 \end{aligned}$$

Manufacturer Smith, on the other hand, designs a lamp also utilizing a 10-inch mirror working at a distance of 25 inches. The geometric focus of Smith’s mirror, however, is 4 inches. The spurious rating of Smith’s mirror is  $F:25/10$ , or  $F:2.5$ , the same as Jones’ mirror. But the true speed of Smith’s mirror is:

$$\begin{aligned} &4 \times 25 \\ (1) \text{ True focus} &= \frac{\quad}{4 + 25} = 3.45 \text{ in.} \\ &3.45 \\ (2) \text{ True speed} &= \frac{\quad}{10} = F:0.345 \end{aligned}$$

#### ‘True’ Speed Ratings for Mirrors

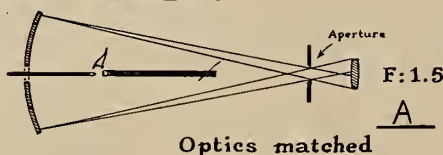
Although both these mirrors are erroneously rated as  $F:2.5$ , the true speed of Jones’ mirror is  $F:0.484$ , and the true speed of Smith’s mirror is  $F:0.345$ . Smith’s mirror, having the lower  $F$ -number, is accordingly “faster” than Jones’ mirror. In fact, the optical efficiency of Smith’s lamp is fully 140% that of Jones’ lamp<sup>3</sup> ( $1/.345$  divided by  $1/.484$  times 100 equals 140%).

We cannot escape the conclusion that the spurious  $F$ -numbers used by lamp manufacturers to rate mirror and condenser speeds are of no value whatever in any consideration of matched optics!

But this is not all. It can also be proved that a lens which is perfectly

<sup>3</sup>It may be inferred from this comparison that the efficiency of lamp mirrors may be increased by having the focal length as short as possible. That is true; but the shortness of focus is limited by the diameter of the positive crater. To exceed this limit would result in an oversize spot at the aperture, with consequent waste of light.

#### Mirror rated $F:2.5$



#### Condenser rated $F:2.5$

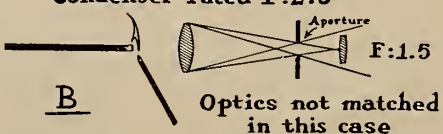


FIG. 3. A projection lens which is matched to one lamp is not necessarily matched to another lamp having the same “speed”.

matched to the optics of one lamp is not necessarily matched to other lamps having the same speed, true or spurious.

Figure 3 shows two lamp optical systems, one having a 10-inch mirror placed 25 inches from the aperture (A) and the other a 4-inch condensing lens placed 10 inches from the aperture (B). (The condenser is shown as a single biconvex lens to simplify the drawing. Actual condensing lens assemblies consist of two plano-convex or aspheric lenses. This diagram does not represent any actual equipment.)

Both lamps, it may be seen, have the same speed of *F*:2.5, and if the crater to converger distances were proportional, they would have the same true speed, or *F*-number.

### Unorthodox Conclusions Reached

Observe that the beam from the aperture "spreads" most rapidly when the comparatively close condenser is employed. The result is that the *F*:1.5 lens which matches the *F*:2.5 mirror is too "slow" to match the *F*:2.5 condenser! Another unorthodox conclusion is forced upon us: that even the true optical speeds of lamp condensing systems should not enter directly into a consideration of optical matching in projectors! And more surprising facts are in store for us.

At this point we may advantageously review our definition of matched optics. You will recall that lamp-optic speeds, real or otherwise, were not even mentioned in the definition. Nor is there any need to bother with them. For the remainder of this discussion, where we really get down to brass tacks, lamp speeds will be entirely ignored.

Our definition makes it clear that we need be directly concerned only with the dimensions of the aperture light beam at a distance from the aperture equal to the focal length ("infinity focus position") of the lens being used. Ordinary observation reveals that the light from

*F*-number of lens matching lamp optics

$$F_n = \frac{f + \frac{m}{1 + \frac{b}{\sqrt{h^2 + w^2} - 2\frac{r}{\pi}}}}{\sqrt{h^2 + w^2} - 2\frac{r}{\pi}} \left[ f + \frac{m}{1 + \frac{b}{\sqrt{h^2 + w^2} - 2\frac{r}{\pi}}} \right]$$

FIG. 4. This formula is the basis for the optical matching principles discussed in the accompanying article. The simplified 35-mm matched optics formula was derived from this general formula, in which *f* is the E. F. of the projection lens, *m* is the working distance of the condenser element, *h* is aperture height, *w* is aperture width, and *r* is the radius of the aperture corners if they be rounded. All dimensions are in inches.

when used as a divisor of focal length, gives the *F*-number of a perfectly matched lens of that particular E.F.

### A Simplified General Formula

Figure 4 presents the completely resolved general formula for the computation of lens matching speeds. However, there is no need for theatre projectionists to employ this complicated expression. The fortunate fact that the diagonal of the 35-mm soundfilm aperture is very close to 1 inch makes possible an amazing simplification of the general formula. It should be remembered, though, that the simplified formula is applicable only to 35-mm. soundfilm projectors. "Matched" lens *F*-number =

$$\text{Lens E.F.} \times \frac{\text{Working dist.}}{\text{Mirror diam.} + 1}$$

$$\text{Lens E.F.} + \frac{\text{Working dist.}}{\text{Mirror diam.} + 1}$$

This simplified matching formula is very easy to use. Following is a complete explanation of the four steps required.

To find the *F*-number of a lens of given E.F. which exactly matches any specified lamp optical system: (Note: When condensing lenses are used, the word "mirror" should be changed to "condenser.")

1. DIVIDE the mirror-aperture distance by the diameter of the mirror plus 1 inch.
2. MULTIPLY the number found in (1) by the E.F. of the projection lens in inches. (Retain this result for use in (4).)
3. ADD to the number found in (1) the E.F. of the projection lens in inches.
4. DIVIDE the number found in (2) by the number found in (3).

The results obtained by using this formula are rather startling. In the great majority of cases the speeds of projection lenses matching lamp optics

are considerably higher than the most rapid lenses available commercially!

### Two Typical Examples Cited

A certain well known arc lamp, for example, has a mirror 11<sup>3</sup>/<sub>8</sub> inches in diameter and a working distance of approximately 30 inches. In Table A are tabulated the *F*-numbers of lenses of different focal lengths which exactly match the optics of this lamp.

Another widely used arc lamp employs a condensing lens, the converging element of which is 6 inches in diameter. The working distance is 12 inches. The *F*-numbers of a few lenses which match this lamp are shown in Table B.

The failure of the most rapid commercial lenses to fulfill the requirements of exact matching in most cases may not be quite as serious a matter as it would seem at first thought. The light beam coming from the aperture is not homogeneous. Its outer regions are far less intense than the central parts, thus the loss in picture brightness and uniformity of illumination will not be serious if the size of the lens comes up to a certain optimum speed which may be considered a satisfactory approach to the ideal state of perfect matching.

But common sense cautions us to bear in mind that the cross-sectional area of the outer, fainter portions of the light beam is too great to be entirely ignored. A happy medium must be ascertained in this as in other matters of choice between the impracticable ideal and the commercially feasible.

The writer has no idea what percentage of the perfectly matched speed the optimum speed should be. This matter requires extensive experimentation and a high order of judgment. If we arbitrarily set the optimum lens speed at 80% of the matched lens speed, then a lamp system which requires an *F*:1.5, 4-inch lens for perfect matching would function

TABLE A

Projection Lens E.F.	Matched Speed
4 inches	<i>F</i> :1.51
5 "	<i>F</i> :1.63
6 "	<i>F</i> :1.72
7 "	<i>F</i> :1.80
8 "	<i>F</i> :1.86

the aperture diverges, or spreads out. The degree of divergence, and hence the diameter of the light beam at the specified distance from the aperture, depends on the dimensions of the aperture, the diameter of the mirror or condenser, and the working distance of the mirror or condenser.

These interrelated functions may be integrated to give an expression which,

TABLE B

Projection Lens E.F.	Matched Speed
4 inches	<i>F</i> :1.13
5 "	<i>F</i> :1.19
6 "	<i>F</i> :1.24
7 "	<i>F</i> :1.28
8 "	<i>F</i> :1.31

acceptably with an *F*:1.9, 4-inch lens (80% × 1/1.5 = 1/1.9). The writer opines, however, that 80 percent is not sufficient.

How can the question of optimum lens speed be settled? The Society of Motion Picture Engineers appears to be the logical body to conduct such an investigation. After observations on all types of pro-

(Continued on page 33)

# The Present Status of Theatre Tv

**D**URING 1944-46 the Theatre Television Committee of the SMPE worked on many of the various engineering problems related to placing television in the motion picture theatre. Also during these years, Paul J. Larsen, together with other representatives of the Society, appeared before the Federal Communications Commission (FCC) and succeeded in obtaining for the motion picture industry frequency allocations for theatre-Tv use on an *experimental basis only*.

The Motion Picture Association (MPA) was then approached with repeated requests that it cooperate in the work of the SMPE, if it had any reason to believe that it would be practical. Neither producers nor distributors, however, were interested in theatre-Tv at that time, nor were they particularly concerned about Tv as a competitive entertainment medium.

The exhibitors, on the other hand, showed some concern but did not wish to take any active measures either on their own or with the SMPE. The general attitude seemed to be that it might be possible to buy into the Tv industry at some future date and thereby save the high cost of research and development.

## Freeze-out Is Narrowly Averted

In November 1946 a point had been reached where it was believed that a definite statement of interest by the motion picture industry was required if the work were to continue. In addition, public hearings before the FCC were scheduled for early 1947 at which it was proposed to reallocate to other services the frequencies provided for experimental theatre use.

In spite of the lack of interest shown, the SMPE again undertook having a brief prepared, and Mr. Larsen appeared before the FCC on February 4, 1947 (FCC Docket No. 6651). Immediately preceding the hearings a telegram was received from the MPA endorsing the SMPE's stand. A similar telegram was sent to the FCC three weeks following the hearings by the independent producers.

The decision of the FCC was handed down early in 1948, and while it did not provide specific frequency allocations for theatre use, it did make available certain frequencies which still could be used by the motion picture industry for experimental purposes.

Consequently, even though the industry's position is weaker from the standpoint of obtaining a permanent part of the spectrum, the SMPE decided to con-

This interim report of the Theatre Tv Committee of the Society of Motion Picture Engineers, presented here in condensed form, is a statement of the present state of the art written in non-technical language. In addition to its wealth of useful information, this candid appraisal of the current situation constitutes, in the opinion of IP, an indictment of the motion picture industry on the score of its shortsightedness, ineptness, lack of courage and downright stupidity for its failure to assume its proper place in the development of this new entertainment medium.

tinue its engineering work. It was agreed to prepare a comprehensive report outlining the present state of the art in so far as it regards the motion picture theatre, and again to seek the cooperation of the industry as a whole.

## Governmental Regulations Outlined

No Federal license or governmental permission is required for the establishment of a theatre-Tv *receiving* station, either for the reception of programs by wire or coaxial cable or by radio. However, municipal regulations may control the placement of masts or other structures on roofs, the guying of reinforcements of such structures, and the safety of any electrical wiring of permanent nature installed in the theatre.

If high towers are erected for reception, and if these are so located that they may become an obstacle or hazard to aerial navigation, it is possible that the Civil Aeronautics Authority must grant approval prior to the erection of such facilities.

If one or more theatres in a given city are to receive a Tv program from central studios, means must be provided for carrying the program from the central studios to the theatres in question. The program may originate from live-talent presentations in the studio (or at remote pickup points such as sports arenas, legitimate theatres, or the like), or they may originate from film records previously made.

They may be carried to the theatres by means of specially equalized telephone lines or by coaxial cables, either of which presumably will be furnished by the local telephone company or other public-utility common carrier in the communications service. Alternatively, the programs may be sent by narrow radio beams from a central transmitting station to the individual theatres, where they are received on highly directional antennas or aerials.

If radio beams are to be used, it becomes necessary to secure the approval of the FCC and to receive a construction

permit and, thereafter, a station license to permit the operation of the transmitter which sends the studio program to the various theatres.

## Non-Broadcast Type Transmission

The transmissions in question are *not* broadcast (that is, addressed to the general public), and a broadcasting license would not be required from the FCC. The transmissions are rather of the type known as multiple-addressee messages, which are private communications addressed by a single sender to a group of recipients, each of whom receives the same message. Such messages, unlike broadcasts, are private in nature and are not legally available to the public.

Any central transmitter erected to send Tv programs to a group of theatres will require a suitable tower to support the transmitting equipment. If this tower is a potential aeronautical hazard, authorization will be required from the CAA for its erection. Municipal codes relative to the establishment of towers in residential districts must also be considered.

The FCC has taken the present stand that the distribution of material of a private nature, such as is here contemplated, falls within the scope of the common carriers and that it should, therefore, be handled by a telephone or telegraph company. It is not known whether the FCC will permanently adhere to this policy, particularly in the case of urban Tv studios and transmitters for syndication of programs to theatres.

## Commercial Theatre-Tv Requisites

In any case, the channels (frequencies) assigned to such Tv transmissions necessarily would be different from those used for Tv *broadcasting*. The channels would probably be at considerably higher frequencies, would be wider (to accommodate possibly higher-detail pictures, or color pictures, or both) and might differ from the broadcasting channels in other respects as well.

The SMPE has previously requested

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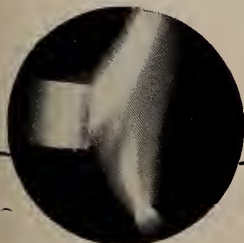
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allocations of channels from the FCC for commercial theatre-Tv but that request has not as yet been granted. It is not known whether the FCC ultimately would grant such channels, but it is believed that their grant would require the following steps:

An individual theatre owner planning to establish a Tv service to its theatres would first apply for an *experimental license* from the FCC to permit him to transmit his programs, purely experimentally and non-commercially, for a specific period. He would be obligated to describe his plans clearly, and to report from time to time to the FCC on his technical progress.

If his experiments were successful, he might then ask that his experimental license be converted into a *commercial license* permitting normal and continued operation during the period of the license (which might be set at three years, or some similar period). The FCC then doubtless would hold hearings to determine the need for and desirability of the service in question. If it found that the service was useful and necessary and that channels were available, it would then grant the corresponding commercial license. City-allocation hearings would also be held.

It should be added that each theatre chain in the same city would require its own transmitting facilities or wire network (unless an interchange of programs or the common use of a single transmitter were acceptable to all involved). That is, for completely independent service each theatre group would require its own transmitter, its own receivers, and its own channel allocations from the FCC.

An individual theatre owner or theatre circuit might arrange for transmission of its programs by an existing Tv station or licensee in a manner similar to current commercial Tv broadcasts.

In addition, for remote pickups outside the main studios it becomes necessary (if radio is to be used to carry the program from the remote point to the central

studios for retransmission to the theatres) to secure an FCC license for the radio-beam transmitter which will carry such programs. Channels are presently available for that purpose and might, for good reason, be obtained.

### **Syndication by Radio Relay**

When nation-wide syndication is involved, it becomes necessary to interconnect the central studios of each network in the cities in which it serves theatres by means of coaxial cables (of the telephone company) or by radio relay (either supplied by the telephone company or other common carrier, or else established by special permission of the FCC as the result of a change in its present policy).

Such radio-relay systems consist of a number of repeater stations, about 30 miles apart, each of which receives the program from the preceding station and automatically carries it forward to the next station. These relay or "booster" stations may be unattended and subject only to occasional inspection and the replacement of expendable material.

In brief, those considering the use of radio in theatre-Tv are particularly directed to the following basic points which may be novel to those not familiar with the field of radio communication.

1. Unlike the motion picture field, Tv by radio is subject to numerous governmental regulations and controls. Consequently, those entering theatre-Tv and using radio transmission, must be thoroughly familiar with governmental rules and procedures and be governed thereby for their own protection.

2. In the second place, Tv by radio requires so-called wide-channel assignments by the FCC. Such channels are scarce and much sought. Accordingly, nonuse of such channels almost inevitably leads to their pre-emption by others.

3. Accordingly, if theatre-Tv is to secure such radio channels, it must promptly request their assignment. However, a mere request is not generally sufficient to persuade the FCC to grant channels.

Usually financial responsibility, definiteness of construction and operating plans, nature of ownership and affiliation, willingness to report all technical (and perhaps program) progress, and other obligations must be made sufficiently clear and definite to justify the assignment of channels.

*There seems little likelihood that a vague expression of general interest or intent will lead to channel assignments.*

4. In any case, even an otherwise satisfactory application for channels must be denied if no available and noninterfering channels are any longer existent, because of prior assignments. The conclusions to be drawn are evident.

### **Projection Systems: Direct Method**

Two basic systems of large-screen theatre-Tv are currently being evaluated in this country. One is the instantaneous or direct projection system by which high-brilliance cathode-ray-tube images are projected by means of an efficient reflective optical system; the other is the storage or intermediate-film system using standard motion picture projection technique, after Tv images have been photographed or transcribed on motion picture film and suitably processed.

Although neither type is commercially available in production quantities, the rapid progress of the art warrants description of equipment in experimental installations.

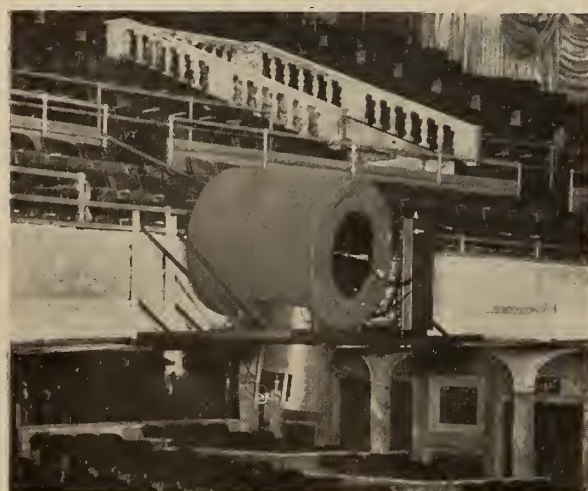
The direct-projection system consists of three major optical elements: 1. the projection cathode-ray tube which is the source of the light image; 2. the optical system which projects the image into the screen; and 3. the screen from which the final image is viewed.

In addition to the optical elements of the system, which are housed in a projection barrel, the electronic auxiliaries include a control console containing the associated Tv equipment, and a power-supply rack.

The cathode-ray tube used in the direct-projection system is similar to the direct-viewing tube used in the conventional receiver, except the projection tubes have a much greater light output resulting from higher voltage operation for which they are designed.

Since available Tv for commercial operation is not adapted, at present, to the use of supplementary light sources as are motion pictures, the brightness of the image available for projection depends upon the efficiency of the cathode-ray tube and the operating potentials. An average picture on a projection tube will draw a beam current of approximately 1 milliampere at a potential of 80 kilovolts. This is a power of

*(Continued on page 29)*



**TYPICAL DIRECT-PROJECTION SYSTEM IN THEATRE**

Optical barrel and adjacent equipment of RCA-20th Fox theatre television equipment located on hangar immediately in front of balcony loge. The cover plate of the lower tube is removed, exposing part of the high-voltage current supply unit. Supplementing this unit and installed in the projection room, is an equipment rack and control panel as part of the receiving terminal unit.



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Written exclusively for *IP*, this presentation constitutes the first publication anywhere of written and graphical data anent the emergency operation of the RCA 200 Series sound systems, including the drive-in theatre equipment.

# Emergency Operation of Sound Systems

By EDWARD STANKO

Theatre Service Division, RCA Service Company

**F**EW events are more upsetting to the projectionist than a totally unexpected breakdown of a serious nature. For example, a stripped gear in a projector, or a sound outage. And if one happens to occur just when the house is packed (they usually happen, somehow, during just such propitious occasions) life for him can be a pretty strenuous affair. Then is when foresight and preparation can pay a handsome dividend.

Mechanical troubles are more easily anticipated. Many parts are readily accessible for inspection. One can see what condition they are in. With electrical parts, it's different. Outward appearance tells little about the remaining life of a part or tube. So it's more difficult to head off trouble even with the best of "spit and polish" routines. Consequently, a sound failure is a danger that must always be reckoned with.

But this need not necessarily cause

every projectionist an immense amount of concern. For many are operating sound systems in the design of which the manufacturer anticipated just such situations by building in emergency provisions of various sorts.

Sometimes these provisions take the form of identical dual amplifiers. Or they may be means for by-passing one of the amplifiers. Or the form of a monitor-emergency amplifier which can be switched in to carry the full house load when necessary. Or provisions for temporarily operating the exciter lamps from a-c, if the rectifier for supplying d-c goes out. Or a switch which by-passes the divider network so that the full tonal range can be fed into the low-frequency (l-f) loudspeaker in the event of trouble with the high-frequency (h-f) unit.

Naturally, there's a catch in this too. The projectionist has to be so well acquainted with his sound system and its emergency features that he can bring them into play without any delays of consequence.

This is not difficult when he has well-engineered equipment. Usually, the manufacturer can supply a chart showing the emergency switches, etc., and instructions on how to use them. And the service representative is willing to do his share toward making the function of each perfectly clear. Of course, to fix the various components in mind, they should be practiced over and over, keeping in mind that more than one unit can be out at the same time and that more than one emergency feature might have to be used to restore sound. Then when the projectionist needs to avail himself of one of these emergency provisions, he can act quickly and with complete confidence in his ability to make the right moves.

For this sort of situation, RCA Co., in conjunction with RCA Theatre Equipment Sales, has prepared a series of Emergency Operation Charts for RCA sound systems in the 200 Series. These systems are the PG-230/234, PG-240/242/244/246, and PG-251 equipments.

These charts, together with supplemental explanatory notes, are published herein.

## PG-230/234 SYSTEMS (Chart No. 1)

These two systems differ only in that the PG-234 has two output amplifiers. Both have a single pre-amplifier and a special high-gain, monitor-emergency amplifier.

### Condition 1: Amplifier

When the EMERGENCY switch on Panel C is thrown from its NORMAL to its EMERGENCY position, the monitor amplifier on Panel A is switched in to take the place of both the pre-amplifier on Panel B and the main amplifier (or amplifiers) on Panel D. When this is done, the volume control on the monitor amplifier, Panel A, is used to regulate the sound level in the auditorium. For an independent adjustment of the monitor volume under these circumstances, there is a MONITOR SPEAKER EMERGENCY VOLUME CONTROL on Panel C.

### Condition 2: Stage Loudspeaker

When the EMERGENCY switch on Panel E is thrown from its NORMAL to its EMERGENCY position, the frequency divider network and h-f loudspeakers are cut out of the circuit and the entire output range is fed into the l-f speaker. In this way the show can be continued quite satisfactorily in the event the h-f loudspeaker goes out of operation.

### Condition 3: Exciter Power Supply

When the switch on the exciter lamp supply, Panel F, is changed from its

CHART 1. EMERGENCY OPERATION PG 230 OR 234 SYSTEMS

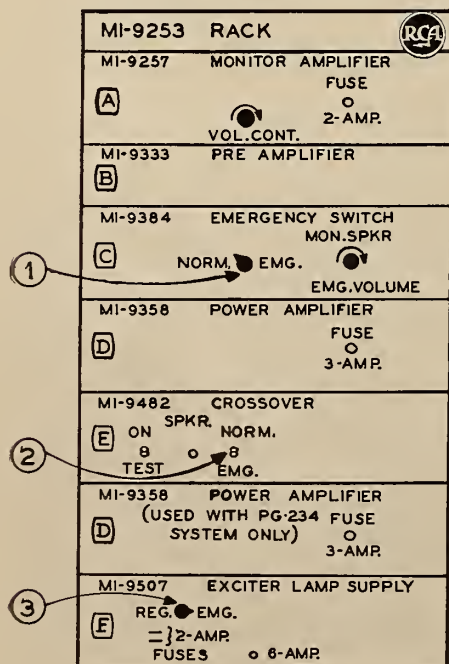
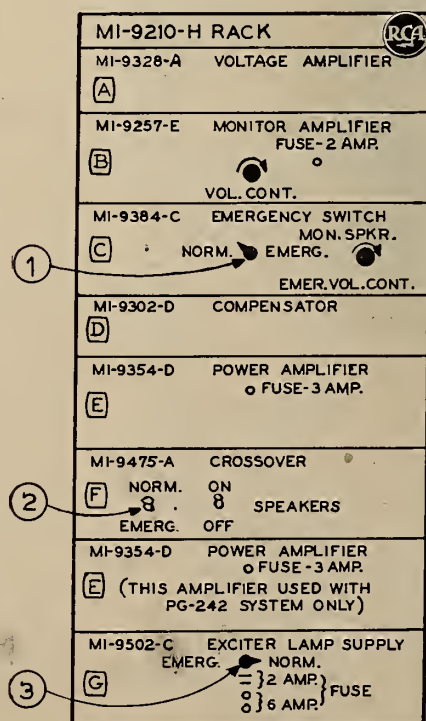


CHART 2. EMERGENCY OPERATION PG 240 OR 242 SYSTEMS



REGULAR to its EMERGENCY position, low voltage a-c is fed to the exciter lamps in place of the normal d-c power.

## PG-240/242 SYSTEMS (Chart No. 2)

### Condition 1: Amplifier

When the EMERGENCY switch on Panel C is thrown from its NORMAL to its EMERGENCY position, the monitor amplifier on Panel B is switched in to take the place of both the pre-amplifier on Panel A and the main amplifier (or amplifiers) on Panel E. When this is done, the volume control on the monitor amplifier. Panel B, is used to regulate the sound level in the auditorium. For an independent adjustment of the monitor volume under these circumstances, there is a MONITOR SPEAKER EMERGENCY VOLUME CONTROL on Panel C.

### Condition 2: Stage Loudspeaker

When the EMERGENCY switch on Panel F is thrown from its NORMAL to its EMERGENCY position, the frequency divider network and h-f loudspeakers are cut out of the circuit and the entire output range is fed into the l-f speaker. In this way the show can be continued quite satisfactorily in the event the h-f loudspeaker goes out of operation.

### Condition 3: Exciter Power Supply

When the switch on the exciter lamp supply, Panel G, is changed from its NORMAL to its EMERGENCY position, low voltage a-c is fed to the exciter lamps in place of the normal d-c power.

## PG-244/246 SYSTEMS (Chart No. 3)

This system has two racks; but the a-c

power to both is controlled by means of the a-c power switch on Panel G (MI-9385) of the MI-9231-B rack. The system features two high-power output amplifiers which are operated in parallel from the voltage and intermediate power amplifier combination used in a PG-240 system.

### Condition 1: Voltage or Intermediate Power Amplifiers

When the EMERGENCY switch on Panel C is thrown from its NORMAL position to its EMERGENCY position, the monitor amplifier on Panel B is switched in to take the place of both the voltage amplifier on Panel A and the intermediate power amplifier on Panel E. When this is done, the volume control on the monitor amplifier, Panel B, is used to regulate the sound level in the auditorium.

An independent adjustment of the monitor volume level under these circumstances can be made by means of the MONITOR SPEAKER EMERGENCY VOLUME CONTROL on Panel C.

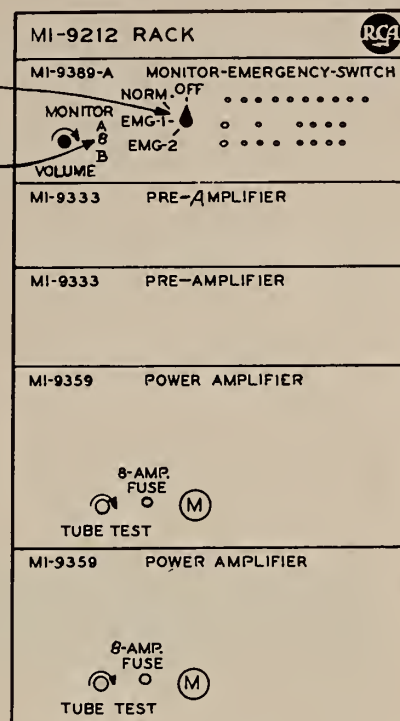
### Condition 2: Exciter Power Supply

When the switch on the exciter lamp supply, Panel F, is changed from its NORMAL to its EMERGENCY position, low voltage is fed to the exciter lamps in place of the normal d-c power.

### Condition 3: Output Amplifier

When the EMERGENCY switch on Panel H of the MI-9231-B rack is thrown from its NORMAL to its EMERGENCY position, the MI-9355-A output amplifiers are cut out and the stage loudspeakers operated directly from the intermediate power

## CHART 4. EMERGENCY OPERATION, PG 251 SYSTEM



amplifier on the MI-9210-H rack.

### Condition 4: Stage Loudspeaker

When the EMERGENCY switch on Panel J is thrown from its NORMAL to its EMERGENCY position, the frequency divider network and h-f loudspeakers are cut out of the circuit and the entire output range is fed into the l-f speaker. In this way the show can be continued quite satisfactorily in the event the h-f loudspeaker goes out of operation.

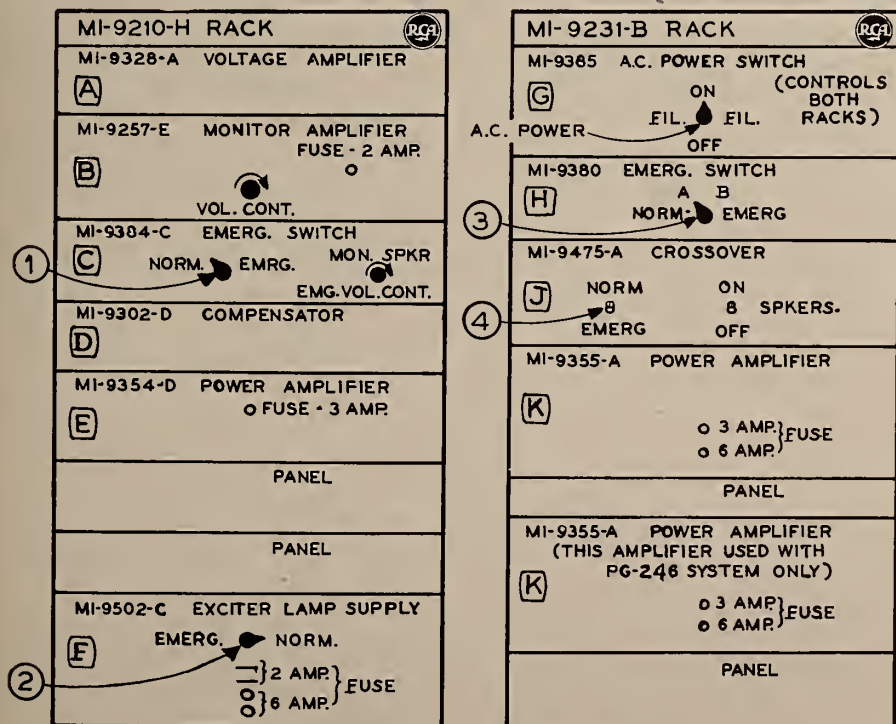
## PG-251 DRIVE-IN THEATRE SYSTEM (Chart No. 4)

This high-power, drive-in system features two complete amplifier channels mounted on a single rack. Each channel consists of a pre-amplifier and a special extra high-power output amplifier. The inputs of the pre-amplifiers always remain connected in parallel. But from that point on the two channels normally operate independently of each other, with each driving one-half of the in-car loudspeakers.

### Condition 1: Amplifier

In the event trouble develops in one of the two amplifier channels, the entire speaker load can be transferred to the other channel simply by manipulating the switch on the MI-9389-A panel. When this switch is turned to its EMG-1 position, all the loudspeakers of Channel 2 are transferred to Channel 1 and the a-c power is shut off from the Channel 2 amplifiers. Similarly, when the switch is turned to EMG-2, all of the loudspeakers that Channel No. 1 normally drives are

## CHART 3. EMERGENCY OPERATION FOR PG 244 OR 246 SYSTEMS



transferred to Channel 2 and the a-c power is shut off from the Channel 1 amplifiers.

In either case, the output transformer tap is also changed automatically when the switch is thrown, so that the impedance matching is not disturbed by the additional speaker load.

The monitor loudspeaker is driven from either channel, depending upon the position of the selector switch immediately to the right of the monitor volume control. Obviously, when the EMERGENCY switch is turned to either EMC-1 or EMC-2, the monitor switch also must be flipped to the appropriate position.

### General Procedure Hints

Naturally, whenever a projectionist experiences a sound outage with any sound system, he should always inspect the a-c line fuses. Moreover, he should know

exactly where these fuses are, what ratings are normally used and where the spares are kept. When he is working under pressure during an outage, it's a poor time to have to start searching and experimenting. Fuses are particularly apt to blow when a tube in the exciter lamp supply or one of the larger amplifier tubes fails.

### Temporary Character Stressed

Emergency provisions such as those described should always be regarded only as *temporary* measures for restoring operation. Just as soon as time and circumstances permit, the projectionist should see to it that the exact source of the fault is located and remedied. To this end, the sound service representative should always be notified promptly of all symptoms of trouble.

sub-base were made the extra pressure nearly always tore the perforations to hell. We use a full-hole positive splice here, as projectionists do not trust the laboratory join known here as a "negative" splice) which is between perforations.

My personal opinion is that this prejudice developed through the use of inferior cement and not through any weakness of the splice as compared with the full-hole splice.

A little research disclosed that the reed-type scraper was the ideal thing; but since the price of an auto-splicer is a bit beyond our reach just now, and such a scraper could not be incorporated in the present form of splicer, I tried again and managed to produce a redesigned scraper which did not mean modification of the splicers now being used and manufactured. I obtained the official blessing of Kodak, and now we are all happy.

Now I am messing about with cements, as I think we do not yet have the very best binding medium possible. Kodak has made up several different grades, which I am testing in the field.

### Over-all Performance Satisfactory

We could find no fault with acetate film on the score of definition, picture quality or sound reproduction, and the stock itself has stood up well irrespective of operating conditions or equipment used. While acetate film would appear on the basis of available data to be somewhat inferior to nitrate stock, our tests have been run with a view to its undoubted great advantages in use no less than to any disadvantages visible to or affecting the paying patron.

A reel-by-reel report three times daily from each theatre has enabled me to compile a complete history of all acetate prints from the moment they were out into circulation. My opinion is that this stock will work out well, provided that we do a little educational work and provide the proper tools.

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## IA ELECTIONS

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### LOCAL 257, OTTAWA, ONT., CANADA

J. McGuire, *pres.*; J. Macauley, *vice-pres.*; A. B. Zumar, *sec.-treas.*; Wm. Hartnett, *bus. rep.*

### LOCAL 424, FALL RIVER, MASS.

George Sullivan, *pres.*; Charles Proctor, *vice-pres.*; Ray Gagnon, *sec.*; Jim Cobryn, *treas.*; Joe Salvo, *bus. rep.*

### LOCAL 473, WILMINGTON, DEL.

Leonard Wright, *pres.*; E. Bolinski, *vice-pres.*; H. W. Rouke, Sr., *sec.*; Frank Eckert, *treas.*; John R. Waller, *bus. rep.*; Phil Jones, Louis Longo, John Maisel, Leo McCarns, *exec. board.*



### To the Editor of IP:

Recently your Monthly Chat column mentioned the complete disregard of film distributors for the projectionist, even though the latter represents the interest of their customers, the theatres. You were concerned then with the quiet, almost secret, manner in which distributors sought to slip acetate prints into circulation.

Later you compiled and brought to the attention of projectionists a list of film titles due to be issued on acetate stock. You also published a scathing denunciation of exchange practices in general, with particular emphasis upon procedure in the issuance of acetate prints.

We run the Fox News on weekends. For the past two weeks these releases have been on acetate stock. Needless to say, there was no advance warning, either by letter or by a notice in the film can, as to the character of this film. The only thing out of the ordinary was the receipt of these prints a day in advance of the usual schedule.

### Acetate Splicing More Exacting

Luckily, we have been using all-purpose film cement for some time now, thus the splicing of these prints occasioned no difficulty. However, everybody is, or should be, aware of the fact that, despite assurances from Eastman, *et al*, the splicing of acetate film *does* require more care than does nitrate stock. If this film had arrived at the last moment (which does happen), necessitating a hurried splicing job, any ensuing break would have meant a blasting for the projectionist.

In addition to warning the boys about

Fox News, it seems important to stress that *all* prints are now suspect and require inspection to establish their character.

ALFRED REVZIN

Kent Theatre, Bronx, N. Y. (Local 306)

The following communication is the reply of a prominent British technician, who asks that he not be named, to a request by IP for data relative to the progress of acetate film in Great Britain.

### To the Editor of IP:

We printed on acetate stock five release prints of two features and sent them around the circuit on a special route but under normal circumstances. The major tests covered 30 theatres—that is, three weeks—but we still are running the prints literally to death.

We have a fine variety of equipment in our theatres, both old and new, thus the film had a taste of everything. Profiting from all the data published, especially in IP, we had very little trouble.

We issued specific instructions anent splicing, together with supplies of the proper cement. The boys had a little trouble at first in removing the sub-base without removing *all* the base, but this difficulty soon cleared up. I found that a good splice demands the use of a splicer, the hand splices lasting only a few days. So we supplied the theatres with splicers.

### Splicer Scraping Block Change

This brought to light another trouble wherein the splicer scraping block, while good enough for nitrate film, was of such design that when attempts to remove the

# T-Number vs. F-Number Lens Markings

*Bearing directly on several aspects of the preceding article by R. A. Mitchell is the appended commentary by the editor of The British Journal of Photography anent the proposed substitution of T-numbers for the time-honored F-numbers.*

IT IS possible that the majority of people have not heard of *T*-numbers, so we will explain what they are and, first, how they arise. Nearly everyone knows that when light falls on a glass surface, whether it be plane or curved, a certain amount of light is reflected away from the glass and thus is not transmitted by and through it.

The amount of light so lost depends in part on the refractive index of the glass, but still more on the angle of incidence of the light onto the glass surface.

If the beam of light is at right angles to the plane of the glass, the loss by reflection is at a minimum; whereas if the beam approaches at an acute angle to the glass surface, the loss is much greater, and it increases rapidly as this angle becomes more pronounced. That happens at any glass-air interface, thus if we have a lens built up of several components, as is usually the case with modern lenses, then losses of the kind mentioned will occur at every glass-air face, and the aggregate loss of light will be very appreciable.

Some years ago it was discovered that if the glass surface could be treated in such a way to provide it with a very thin coating of a substance having a refractive index equal, or nearly equal, to the square root of the refractive index of the glass, and ensure that the coating should be  $\frac{1}{4}$  wave-length of light thick, then the loss of light by reflection was very much less.

In fact, in a lens of several components it might well happen that when the lens faces were so treated the lens would transmit more than 20% additional light. Such treatment of lenses is now a normal commercial procedure by many important optical instrument manufacturers and is becoming the rule for good-quality lenses.

## Genesis of the *T*-Number

It is out of this state of affairs that the *T*-number has arisen; but before we discuss its importance we have to know what relation it bears to our old friend the *F*-number, which some people want the *T*-number to supersede.

We assume that every technician knows that the *F*-number of a lens is the ratio of the focal length of the lens to its effective diameter. Thus, if a lens has a focal length of 4 inches and admits a beam of light of a diameter of 1 inch, we say it has a relative aperture of *F*:4.

We have been using this system for a very long time, but until quite recently have never paid much attention to the fact that it was quite a common thing to find that lenses having the same *F*-number varied measurably in speed. This was due to their having noticeably different powers of transmitting light. We should expect, for example, a single component lens to transmit more light than another lens of identical diameter but made up of, say, four components.

When it was found that by coating, or "blooming," lenses they could be made to transmit much more light—in fact, from 20% to sometimes as much as 33%

## ALTEC MINI-MIKE NO LARGER THAN STACK OF 6 DIMES

**S**MALLER in height than a stack of six dimes, and even smaller in circumference, the new Altec-Lansing 21-B microphone is revolutionary in design and embodies exclusive features heretofore unobtainable in a high-quality microphone. Unprecedentedly small in size—it weighs less than  $\frac{1}{4}$  ounce—the 21-B covers the complete audible range both as to spectrum and to loudness.

Adaptable to all types of stand mountings or overhead suspensions, the 21-B is so inconspicuous that the artist or speaker can direct his entire attention to the audience. This facility was a fundamental concept of the microphone's design.

## Designed on Electrostatic Principles

The 21-B is designed on the basis of electrostatic rather than magnetic principles. The only moving element employed therein is an extremely small diaphragm actually no larger than the human eardrum, yet the sound output from this tiny apparatus is somewhat greater than from conventional microphones.

Outstanding among this unit's features is the fact that it is blastproof, thus it is not necessary to protect it from loud sounds and shocks which cause extreme distortion or actual damage to many types of microphones. It is completely non-directional, or, as its makers term it, "omni-directional." It is no longer necessary for performers to limit their speech to the "live" side of a microphone, since the Altec microphone is "live" on all sides. A small circumferential sound channel prevents tonal discrimination at all angles from the sound source.

When used in public address systems the unusually smooth response to all frequencies makes possible as much or

—it was realized that a system of lens marking taking this factor into account would be of value to certain classes of lens users.

## Light-Transmitting Power

The idea was to have a *T*-number scale in addition to the usual aperture ratio or *F*-number scale, so that all lenses, no matter of what make or aperture, would have the same light-transmitting power when the diaphragm was set to the same *T*-number of the *T*-scale. Such a *T*-scale would be engraved in a series similar to that adopted for the *F*-numbers, i.e., would give numbers proportional to 1,  $\sqrt{2}$ , 2,  $2\sqrt{2}$ , 4, and so on as required.

Perhaps the essential difference between the *F*-number and the *T*-number is most clearly seen when the definition of the *T*-number is given. It is defined as

*(Continued on page 27)*

more loudness before feedback than can be obtained with directional microphones. In outdoor use, the microphone's lack of susceptibility to changes in wind pressure, and its freedom from "false bass build up" when used close to sound sources, enables excellent performance under conditions where old-type microphones produce unbearable noises.

## Special Accessory Mountings

Altec also displayed special mountings for sports announcers, consisting of a breastplate weighing a few ounces, a lapel clip mounting for public speakers, and a special holder designed for concealment in television and motion picture sets. Within a few hours after being demonstrated to a select group of audio engineers, the Altec 21-B was placed in operation on the stages of several of New York's largest motion picture presentation theatres, and it was also adopted for general use by the annual convention of the Institute of Radio Engineers.

Graphical evidence, to exact scale, of the in-a-nutshell character of the new Altec 21B electrostatic-type microphone.



# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**E**LSEWHERE in this issue appears a small item of giant significance relating to the payment this month by Eastman Kodak Co. of \$13 million in wage dividends. This is no knuckling to "pressure"; on the contrary, the payment represents the 37th consecutive annual such distribution of a *fixed percentage* of common stock dividends. This item set up a train of thought which we pass along herewith.

First, we contrasted this item with the statement by Atlas Corp., investment trust outfit of New York City, that it had realized \$17 million *profit* from its "long-term investments in RKO." This display of the absentee-ownership power of the dollar (a mere bookkeeping transaction requiring not a sliver of manual labor) reflected, to quote Atlas' own statement, an average return of more than 20% on the average annual amount invested in RKO." Very nice going, indeed, for those dollar share-croppers who year after year take refuge behind the "sound national economy" phrase to combat a minimum wage law.

Second, we contrasted the Eastman record of employee benefits with the first feeble efforts in our own craft to establish some degree of worker security. The trail-blazing achievement of Chicago Local 110 in establishing an employee-welfare plan based on a definite mathematical formula is merely a straw in the wind, provided our own people display enough foresight to profit by this example.

Eastman Kodak Co., with a record \$55 million dollar net profit for 1948, certainly is not in need of any pats on the back from such an obscure quarter as this department, nor are these few words intended as such. Yet, so sharp is the contrast between the Eastman employee-benefit record with the dollar-grasping attitude of our industry's "leaders," that we felt it necessary to spread these few words upon the record.

Certainly, too, away back in 1912 there was nothing in the social structure that *compelled* George Eastman to initiate any employee-benefit program. Keep in mind that this Eastman wage dividend is *in addition* to the usual employee-benefit plans adopted, however reluctantly, by all progressive business enterprises—life insurance, sickness insurance, retirement annuities, social security, loan provisions, etc.

Possibly George Eastman builded better than he was aware of 37 years ago. But there can be no disputing the fact that he recognized the dignity of Labor and subscribed to the principle that some portion of the dollars accruing to any business enterprise should go to those whose brain and hand contributed so mightily to their making—the worker. Could it be the Eastman policy in this respect was a vital factor in the gigantic success attained by this company?

- George Schaffer, former business agent of Los Angeles Local 150, was tendered a testimonial dinner by a group of Local 150 members. The presentation of a beautifully engraved watch came as such a complete surprise to George, that he was rendered speechless — no mean achievement, incidentally.

- At a recent hearing before the Senate Committee, Charles E. Wilson, president of General Electric, made the following statement: "I can't agree that there are any abuses in the Taft-Hartley Act. I honestly can't find them."

We think that Mr. Wilson would have little trouble in finding many abuses in the T-H Act if he were sitting on the other side of the fence—if, for instance,

he were in the position of a projectionist who, after working for a company for four years, was arbitrarily dismissed from his job because one of the "little executives" of the firm didn't like the way the projectionist combed his hair or tied his tie. In a particular case where just such a thing occurred, the projectionist appealed to his Local officials, but they told him that because of the T-H law "their hands were tied," and could do nothing for him. If Mr. Wilson were that projectionist, he would inevitably find plenty of abuses in this anti-labor law.

- Film supply houses in the Los Angeles area recently agreed to a 20¢-per-hour increase for their projectionist employees.

This is getting off to a good start for Magnus Nielsen and Earl Hamilton, newly-elected officials of Local 150.

- Larry Davee, sales manager for Century Projector Corp., was the guest speaker at a recent meeting of the International Projection Society, the members of which all belong to Toronto Local 173. Larry was scheduled to make a brief address, but his talk was so interesting and informative that the boys refused to let him off the rostrum for several hours—and then he had to beg off.

- Among the visitors to IP headquarters recently were the too-long-absent Herb Griffin, vice-president of International Projector Corp.; George Raaflaub, secretary, and Harry Burley, business agent of Syracuse Local 376; Clarence J alas, secretary of Chicago Local 110; and that perennial Texan, the best National Theatre Supply Co. branch manager in New York City, Allen Gordon Smith.

- Bert Sanford, manager of theatre equipment sales for Altec Service Co., was appointed vice-chairman of the Motion Picture Committee for the 1949 Catholic Charities Drive. Not only has Bert served on many charity drives, but he also gives unstintingly of his time and money to hardship cases that come to his attention.

Recently, while visiting a friend in a certain hospital, he met another patient there who had been bed-ridden for the past 12 years. Charitable organizations closed their records on this particular case and the patient was very despondent. Upon hearing his story, Bert immediately got to work and not only did he have this man transferred to another hospital where, for the first time in 12 years, he is responding to treatment, but he keeps in constant touch with him by means of frequent visits and by telephone, in addition to generous gift packages. A pretty swell guy!

- Coming out of the Masonic Temple several weeks ago, George Raaflaub, Syracuse Local 376, fell on the slippery pavement and broke his wrist. Now pretty well on the mend, George is seri-

ously considering writing a book on how to break a wrist when one is cold sober. Should be very illuminating—not hallucinating.

- A salary increase of \$4.50 per week, on a 40-hour work week, for more than 6,000 front-office and backroom exchange workers has been announced by the IA. The increases are retroactive to December 1, 1948. The IA negotiating committee, appointed by President Walsh, comprised Thomas Shea, assistant International president; Louise Wright, International vice-president, and Joseph Basson, International representative.

- The IA seeks no quarrel with any other labor organization in the Tv field and it would prefer to establish harmony through peaceful negotiation. The maintenance of IA jurisdictional rights, however, is of paramount concern to every IA member and constitutes the cornerstone of IA negotiating policy.

This was the statement by IA President Dick Walsh in a recent news conference for both the trade and lay press. IA "jurisdictional rights" were defined by Walsh as those "earned" through years of activity in show business as well as those gained by organizing along well-defined lines since the advent of Tv. Walsh was impelled to call the press gathering by what he referred to as the "threatening" tone of press releases by the National Association of Broadcast Engineers and Technicians (NABET).

Citing extended futile conferences with NABET in an effort to settle Tv jurisdictional lines, Walsh said that the expiration on April 30 next of contracts between NABET and both NBC & ABC Tv networks would likely touch off the "fireworks." An agreement with the IBEW on the allocation of video electronic jobs, and the fact that the IA even now has a working agreement with a NABET local chapter in Detroit, was evidence, said Walsh, that the IA was "leav-

#### GUESTS AT LOCAL 521, LONG BEACH, CALIF., 39th ANNIVERSARY GET-TOGETHER



Left to right: Carl Cooper, IA vice-president; Herbert Aller, business agent, Hollywood Local 659; Frank Sawyer and George Schaffer, Los Angeles Local 150; Roy Brewer, special IA representative.

ing the door wide open" for future peaceful negotiation and had no intent to indulge in any "raiding tactics against any legitimate labor group."

It was gathered from Walsh's remarks that he regarded the IA entitled to jurisdiction over all jobs "in front of the Tv cameras," with the positive inclusion of both projectionist and stagehand jobs.

- We regret to report that William Doss, 53, charter member of Syracuse Local 376 and chief projectionist at the Eckel Theatre for the past 30 years, died suddenly last month. He was a member of the 25-30 Club and of Syracuse Lodge No. 501, F. & A. M. He is survived by a brother, George, and a nephew, George E. Doss, both members of Local 376.

- Hollywood Local 705 (Costumers), in negotiations with the major studios, proposed that a 10% cut on all reissues be put into the Local pension fund. This proposal is now being considered by studio representatives and there is a strong possibility that it may be approved.

- Hugh J. Sedgwick, business agent for Local 303, Hamilton, Ont., Canada, and secretary for the 11th. District, was re-

elected secretary of the Ontario Provincial Federation of the Canadian Trades and Labor Congress. Hugh was the fraternal delegate from Canada at the last AF of L convention.

- A record-breaking attendance marked the 27th Anniversary celebration last month of Local 521, Long Beach, Calif. The dinner-dance was held in the Star Room of the popular Hill Top Cafe. Among the out-of-town guests were Carl G. Cooper, IA vice-president; George Abrams, secretary of San Diego Local 297; William Wise, business agent of Local 297 and president of California District Council No. 2. Los Angeles Local 150 was represented by Earl C. Hamilton, president; Magnus Nielson, business representative, and Hal Huff.

In charge of arrangements were Paul King, Alonzo Bennett, and Everett Covington, all of whom earned the vote of thanks extended for their work in making this one of the most enjoyable parties ever given by the Local.

Local 521 is very proud of the working conditions enjoyed by its members, such as the 6-day week (5-6 hour work days); two-man shift; two-week annual vacations with pay; pay for daily preparatory time; excellent sanitary facilities, and well-ventilated projection rooms. The members also receive hospitalization and surgical benefits, and weekly sick benefits.

The eight original charter members are still alive and active: Alonzo Bennett, William Brown, Donald Dean, Elliot Kirby, Claud Leyman, Sr., Frank Petrich, Eugene Tracy, and Arthur Wiley.

- Edward deVere Maule, member of Hollywood Local 165, was appointed chief projectionist at the Hollywood Paramount Studios, succeeding the late Joseph J. Lynch. Born and raised in Philadelphia. Ed Maule showed an early interest in electronics. He served in the

(Continued on page 26)

#### LOS ANGELES LOCAL 150 GROUP HONORS FORMER BUSINESS AGENT



Committee for surprise testimonial dinner: Don McLaren, 'Pop' Kenton, Harold Edinger, Frank Sawyer, George Schaffer, the guest of honor; Jim Pointner and Walter Preston.

# Total Lumens vs. Screen Light Distribution

By MARK STEVENS

**G**REAT improvements in projection lighting have undeniably been instituted in the course of years. "The record of progress," states the National Projector Carbon Handbook, "shows a 10:1 improvement in the brightness of the source, a 30:1 improvement in efficiency of screen light production, and a 90:1 improvement in the volume of light on the screen, together with marked improvement in color quality and steadiness."

No mention is made of progress in screen light *distribution*, however, for there has been none. Indeed, standards in this regard have slipped so badly that the writer feels impelled to voice once more the fact that the projection craft is being unfairly imposed upon.

## 'Hot Spot' Projection Blight

"Hot-spot" projection is the number-one blight on the efforts of conscientious projectionists today. Screen illumination measurements conducted by the SMPE and local unions reveal that fully two thirds of the total number of theatre projectors tested provide a side-to-center screen illumination distribution of only from 50 to 75%. It is impossible to deliver screen results any better than the equipment permits.

In an optical sense, the low-intensity (l-i) carbon arc was tailor-made for projection purposes. The central core of the positive carbon was somewhat less luminous than the surrounding shell of hard carbon, a condition which counteracted to a large degree the spherical aberration of the elliptical mirror and the unavoidable vignetting effect of the projection lens. (Projection lenses, even the modern  $F:1.9$  and  $F:2.0$  sizes, are

seldom large enough to be considered truly matched to the lamp optics.)

The inception of high-intensity (h-i) light sources, far superior to l-i arcs in light volume and color characteristics, introduced a brand new problem—one which could easily be solved but which responsible quarters have chosen to ignore. The central portion of the intensely luminous ball of gas held in the crater of the h-i positive is far brighter than its edges. This causes a hot spot to be part and parcel of the image of the arc on the aperture, and the more perfectly the arc image is focused, the more pronounced is the hot-spot effect.

Needless to add, this inherent hot spot augments the vignetting effects introduced by spherical aberration of the condensing element and lack of lens-lamp optics match.

## Acceptable Field Illumination

An acceptably uniform field of illumination may be obtained by throwing the h-i arc slightly out of focus—but at what a cost! The loss of light is exceedingly great, and an undesirable bluish color is introduced. The projectionist, therefore, has no choice but to adjust his h-i arc so close to the position of maximum light production that a decided hot spot mars the beauty of the picture.

Let nobody disparage the technological astuteness of the projectionist. Projectionists know what they want in the way of screen results, and they not infrequently come forth with suggestions which can readily be shaped up for the factory and incorporated into commercial equipment units. And 99% of these suggestions are offered free of charge!

Out and out "boners" in equipment design most certainly do occur. All of us make mistakes, and for that reason, if for no other, minor miscalculations are forgivable. But a blatant disregard of projectionists' requirements is the unforgivable sin, and it is high time for the craft to arouse the self-satisfied by a searching investigation into the why's and wherefore's of each new unit offered in a confusing fanfare of ballyhoo.

## Promotional Tactics Questioned

The promotion of projection lamps not infrequently follows the selling line heretofore confined to the toothpaste and kitchen-soap businesses. All too often there are frenetic attempts to dazzle the craft with a superabundance of lumens

and to high-pressure the projectionist into abandoning all standards of quality light production in favor of quantity. Studiously omitted is an honest appraisal of light quality and *distribution on the screen*.

Projectionists are not, as a rule, swept off their feet by ecstatic hoopla that a lamp projects X-thousand lumens to the screen when drawing only Y amperes, however intriguing this information may be. Other factors are involved. "What about the side-to-center distribution of light on the screen under average conditions?" the projectionist asks; and the manufacturer grudgingly divulges the none-too-flattering information previously kept under wraps. (Naturally!)

What could possibly be the color characteristics of the light output of a lamp advertised as producing a greater proportion of visible wavelengths than, presumably, any other high-intensity lamp? The idea prompting this intelligence is that heat filters are unnecessary. Now, all of us know that, in comparison with l-i lighting, the light-curve of all h-i carbon-arc sources falls off rather sharply in the infra-red region, and that no wave-length of visible light can exactly be described as "cold." And yet no

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## SMPE 65th Convention Set for New York, April 4-8

The 65th semi-annual convention of the Society of Motion Picture Engineers will be held at the Hotel Statler (formerly the Hotel Pennsylvania), in New York, April 4 to 8, inclusive. Reports and demonstrations of the latest developments in theatre television and high-speed photography will be the subjects of special sessions and symposia during the first three days of the convention, announced Earl I. Sponable (20th Century-Fox) President of the Society.

With theatre Tv rapidly approaching the commercial stage and other technical facilities of the motion picture industry undergoing intensive laboratory development, a major concentration of leading engineers is expected at the convention to participate in a rich variety of technical sessions.

William H. Rivers, chairman of the Atlantic Coast Section, is in charge of local arrangements, and William C. Kunzmann, convention Vice President, will supervise registration and information for the meetings.

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## Record Eastman Earnings, Employee Benefit Payments

Eastman Kodak Co.'s net earnings in 1948 were \$55,494,425 after all taxes and charges, equal to \$4.45 per share of common stock, as contrasted with a \$3.64 per-share payment for 1947. Sales during 1948 jumped \$83,644,528 to \$435,395,626, the sales increase of 24% being "largely in the amateur photographic and cellulose product fields."

The annual report revealed that motion picture film sales constitute 9% of the Eastman total. On March 14 Eastman paid a wage dividend of \$13 million to about 50,000 employees in the western hemisphere. These annual dividends are in addition to regular weekly wages and all other employee social benefits.

figures are given to support the assertion.

"The largest," "the biggest," etc., are terms calculated to impress those scarcely capable of counting on their fingers, but a little careful consideration never fails to prick the inflated bubble of such hokum. When such grandiose superlatives are applied to lamp collector elements—mirrors or condensers—they may mean nothing but a bulky projection set-up. For example:

A 16-inch mirror operating 34 inches from the projector aperture has a "spurious," or geometric, speed of  $F:2.1$ . A 6-inch condensing lens the converging element of which operates 12 inches from the aperture has a speed of  $F:2.0$ , and hence is just a trifle faster than the large-size mirror. When the masking effect of carbon supports is considered, it will be seen that the condensing lens is appreciably more efficient than the very much larger mirror.

Consideration of mirrors again brings the matter of hot-spot projection to our attention. We have a right to ask, in view of the different light-production characteristics of low- and high-intensity arcs, whether the mirror in any reflector-type lamp is conventionally elliptical, or whether it is over-parabolized to compensate for the hot-spot nature of the h-i gas ball.

#### Side-to-Center Screen Distribution

No matter how efficient any lamp may be in respect to economy of operation, a side-to-center distribution of screen illumination of only 65% is sufficient reason for rejecting it. A fall-off of 35% in illumination at the edges of the screen is intolerable where high projection standards are maintained. Many h-i lamps, large and small, have the same deplorable defect.

It may be supposed that very careful adjustment of the arc-mirror distance will decrease the illumination fall-off to only 20%—a side-to-center distribution of 80%. In this, however, we are giving any lamp the benefit of a doubt. We merely "assume," on the basis of experience with other h-i lamps, that we could bring the side-to-center distribution up to 80% and thus "get by" after a fashion, even though we are still dissatisfied with screen results. Even so, we cannot escape sacrificing many thousands of screen light lumens.

Reliable data issued by National Carbon Co. indicate that screen lumens will be decreased by approximately 21% when we bring side-to-center light distribution up from 65% to 80%. For more uniform light distribution—supposing that working distance and mirror-arc distance could be finagled to effect such a result—the efficiency of the lamp would be disastrously reduced, and we would have been better off if we had

## National Carbon Co. Releases Data on 9-mm H-I Carbon

FOR some time now there has been in use in scattered localities a 9-mm high-intensity projector positive carbon for use in reflector type motion picture projectors. This carbon, of the "bare" type—that is, without the copper coating typical of Suprex carbons—is 20 inches long and is used with a 5/16- by 9-inch Orotip cored negative.

Performance data anent this carbon trim has been lacking previously, National Carbon Co. evidently holding that insufficient time had elapsed to regard this trim in other than the experimental, or field-testing, stage, and no data was included even in the Projector Carbon Handbook recently published.

Values for this combination burned in an angular trim with a rotating positive

carbon in an  $F:2.0$  reflector and projection system have now been established, as shown in the accompanying table. National Carbon emphasizes that these data were obtained by the same methods and are subject to the same qualifications as described in the SMPE paper entitled "Screen Illumination with Carbon Arc Motion Picture Projection Systems" published in the SMPE *Journal* for January, 1947.

Similarly, the data as set forth are in the same form and might be considered as supplementary to Table V on page 45 and Table VII opposite page 62 of the National Carbon Handbook. Projectionists likely will wish to add this information in printed form to their copies of the Handbook.

Strikingly apparent in the accompanying table is the profound influence of the percentage of side-to-center screen light distribution upon total light lumen production on the screen and particularly at the center. IP readers will recognize in these data a validation of the information presented previously in these pages in articles on projection optics, and especially in the article "Total Lumens vs. Screen Light Distribution" in this issue (p. 20).

#### Side-to-Center Distribution Factor

For example, the table shows that a projection system designed to provide an 80% side-to-center light distribution produces maximum light of 15,400 lumens; whereas a system providing a 55% light distribution produces maximum light of 19,500 lumens.

The significance of these figures will at once become apparent to any experienced projectionist, who understands perfectly that the production of an intense center hot-spot at the expense of illumination in other sectors of the screen falls far short of recognized motion picture projection standards.

Moreover, to all except those purists in the craft who consider 90% or better the only proper side-to-center light distribution standard, 80% is recognized as an acceptable distribution of the total light available.

Over-all, such figures as are presented in the accompanying table focus attention upon that most vital consideration in any discussion of values, whether the topic of interest be projection screen light or wage scales. That most important consideration is "under what conditions" is a given value attained.

### SCREEN ILLUMINATION TABLE

#### 9-mm H-I Carbon, Angular Rotating Trim

Positive Carbon	9 mm x 20" H-I <sup>1</sup>
Negative Carbon	5/16 x 9" Orotip
Arc Amperes	85
Arc Volts	58
Lamp Optics	$F:2$ Reflector
Projection Lens	5" $F:2$ Coated

#### Screen Light Distribution: 80% Side-to-center<sup>3</sup>

Total Screen Lumens <sup>2</sup>	15,400
Ft.-Candles, Center of Screen <sup>4</sup>	
Screen Width of 20 Ft.	30.0
" " " 25 Ft.	19.1
" " " 30 Ft.	13.2

#### Maximum Light<sup>5</sup>: Screen Light Distribution of 55% Side-to-center<sup>3</sup>

Total Screen Lumens <sup>2</sup>	19,500
Ft.-Candles, Center of Screen <sup>4</sup>	
Screen Width of 20 Ft.	45.5
" " " 25 Ft.	29.0
" " " 30 Ft.	20.3

<sup>1</sup>Heat filters may be necessary with this arc. Light values will be reduced approximately 20% if "Aklo" or phosphate glass is used.

<sup>2</sup>Figure is for systems with no shutter, film or filters of any kind.

<sup>3</sup>Refers to ratio of light intensity at side of screen to that at center.

<sup>4</sup>Foot-candle values at center of screen assume 50% shutter transmission, with no film or filters of any kind.

<sup>5</sup>Value with system adjusted to produce maximum light intensity at center of screen.

kept on with the older h-i lamp which we discarded.

A simplified h-i lamp using an 8-mm

Suprex positive and a 7-mm Orotip negative at 70 amperes will produce 13,000 screen lumens with an 80% side-to-center

light distribution under the conditions of a 5-inch  $F:2.0$  coated projection lens.

Mere light production no longer impresses us. Thanks to the unceasing efforts of carbon makers, lumens are relatively cheap today. What is not so easily had, however, is good illumination distribution on the screen. The task of designing lamps capable of producing uniform screen illumination without undue light loss is squarely up to the manufacturers of mirrors and lamps.

### **Ideal Side-to-Center Coverage**

The writer's personal opinion is that *no side-to-center screen illumination distribution under 95% can be considered satisfactory*, and he is confident that all discriminating projectionists concur in this opinion. Naturally, the side-to-center distribution should not in any case

exceed 100%, for that would be a serious error in the other direction. Arbitrarily adopted as the optimum, then, is 95%.

Now, a distribution as uniform as this *absolutely can* be effected without undue light loss by designing mirrors to produce it. This means that the image of the h-i arc on the aperture must be deliberately distorted to smooth out the high central illumination; and, further, the "compensation" must actually be overdone to the extent necessary to counteract the vignetting effect of the projection lens.

Until progress in screen light distribution goes forward instead of backward, the writer, for one, cannot wax enthusiastic over lamps which, as performance is measured, merely repeat those errors which have been with us all too long.

## **An Exhibitor Assays Tv as Movie Theatre Competition**

**T**ELEVISION will prove "very rough competition" for film theatres to meet, and the competition in the event video has access to the same product as theatres will be fatal to the latter, in the opinion of Leo F. Wolcott, board chairman of the Allied ITO of Iowa and Nebraska.

Wolcott, who declares that the tele question confronts exhibitors "two years ahead of schedule," summarizes his findings after a study of Tv in the current bulletin to the unit's members. His conclusions follow:

"Just because movie theatres have been here 'as far back as I can remember' is no sound basis for blind belief they'll always be here. The stage, and particularly vaudeville, were here for ages—until pictures came and talking pictures wrote 'finis' to them both, except in the large cities.

"Apparently, Tv experience to date has proven motion pictures its best medium due to ease of handling finished products, scope, definite running time, and other factors. Accordingly, it is evident the effort will be made to channel more and more movies to Tv.

"Comes now the question: will movies on Tv put movie theatres out of business? It seems to me that depends upon several factors, the most important of which naturally is the return which can be had for the producers of the pictures.

### **Tv Equipment Cost Prohibitive**

"First of all, let it be said here and now that the many thousands of small theatres cannot hope to install Tv equipment at \$35,000 to \$50,000 in the immediate or foreseeable future. Yet these U. S. theatres are and will remain—unless they are allowed to go under from the impact of Tv—the main and best source of revenue for the picture producers, a source which cannot be re-

placed or duplicated. Obviously, people are not going to theatres and pay 50c admission for the same show they can get on Tv at home for free.

"And let us not kid ourselves about man being such a sociable creature that he just must go out to the movies at regular intervals. The beginning days of radio disproved that old gag: the people got together in each other's houses, mixed up some cocktails and sat and listened to the Two Black Crows, Amos and Andy, Fibber McGee and Molly and the other programs of those days.

"It was bad enough for three years then; now Tv, with sound and sight, will prove very rough competition for the theatres to meet, and fatal, if Tv has access to our merchandise, our pictures. It is, of course, conceivable that short trailers of currently theatre-released pictures shown on Tv would prove feasible, and of advantage to theatres, but not the full picture."

## **An 11-ounce Radio Station**

A radio receiver and transmitter as small as a king-size package of cigarettes has been developed by the U.S. Army Signal Corps. This tiny radio "station," weighing 11 ounces, will transmit and receive spoken messages over distances of more than 200 yards. It is believed to be the only radio in the world that contains in one package all the necessary parts, including power supply.

The miniature "transceiver" includes batteries, a two-foot collapsible whip antenna, four tubes and other parts, all contained in a tiny metal case 1 inch thick,  $2\frac{1}{4}$  inches across the base, and  $3\frac{1}{2}$  inches high. The set has a built-in speaker and a mike, and the batteries have a life span of 14 hours.

## **Simplex In-a-Car Speaker's Many Redesign Features**

The Simplex In-a-Car speaker has been redesigned. The speaker case is diecast, using a lightweight, "tough as steel" aluminum alloy. The bare casting is first phosphated to protect it against oxidation and to provide a tough undercoating for the lacquer finish. The entire finish is highly



The new Simplex In-a-Car speaker.

resistant to peeling, chipping or blistering. Drain holes are adequate to empty all condensation or rain water from the interior of the case.

A G.E. 4-inch p.m. aluminum voice coil speaker unit is standard equipment. Conventional speaker units employ a paper-base voice coil, and the best of weatherproofing will not keep all water out. Any water that enters the coil mounting causes it to expand and rub against the magnet. The aluminum coil mounting is not affected by heat or dampness and will not change shape. A heavy Alnico V magnet assures high efficiency.

A push-button switch, controlling the concession signal on the coupling unit, is mounted directly below the volume control knob, permitting signalling by flashing on a light in the coupling unit. The signal switch is optional equipment. Coupling units may be purchased without lamps, sockets or wire form, but with provision for them if it is desired to add lights later.

### **New Method of Speaker Mounting**

A unique method of speaker mounting reduces to a minimum the number of speakers thrown out of cars on the ground. On conventional coupling units the basket is directly in line with the unit. On a dark night, the patron cannot see the basket because it blends in with the coupling unit housing. The Simplex design swings the baskets back at an angle so that the patron can see the basket in silhouette. Two coatings of neoprene are vulcanized to the basket forms to provide a tough, durable finish, impervious to weather conditions.

The terminal strip is designed for all common electrical connections. The electrician may use pliers, wrenches or a screw driver

to lock down the fastening nuts on the terminal bolts, each of which is threaded into the strip so that it cannot turn when external connections are being made.

#### Details of Transformer Construction

A vacuum-impregnated matching transformer is hung under the terminal strip, out of the way at all times. No wax or rubber coating is applied to the transformer, since this is a very ineffective method of waterproofing. Instead, every transformer is placed in a vacuum cell, and when all of the air has been removed, a special weather-proofing material is injected which penetrates all exterior and interior surfaces. The coating, unlike wax or rubber, cannot break or crack and weatherproofs the transformer indefinitely.

A large, heavy-duty cable clamp is provided in each coupling unit to firmly clamp the outside covering of the speaker cable. This prevents damage to the terminal strip should a patron inadvertently drive away with the speaker in his car. Adequate ventilation means are provided to permit rapid evaporation of condensation forming inside the unit.

### Precision-Formed Filaments on New G. E. Projection Lamps

Brighter and surer screening of motion pictures is available to users of 8- and 16-mm projectors as a result of a major improvement in the construction of movie projection lamps. General Electric engineers revealed that, after years of effort, they had been successful in devising a method of forming mechanically the complex filaments used in the projection lamps.

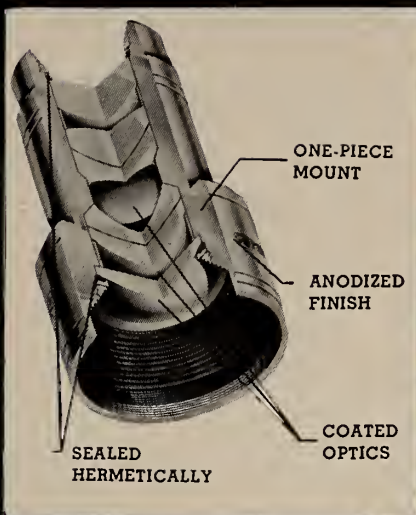
Precision forming of the filaments has resulted not only in improved screen illumination initially, but also in better light maintenance during life, according to the engineers. They said the improved projection lamps also give more uniform performance than those with hand-formed filaments, there being less variation from the average in the life of individual lamps.

#### Output is Greatly Expanded

Previously, engineers explained, the difficult and tedious task of forming the filament, which contains 10 separate coils of fire tungsten wire, was accomplished by girls selected especially for their aptitude for this type of work. After many months' experience, a skilled girl was able to form filaments for only about 80 projection lamps daily.

Lamps involved in the new construction include a 500-watt lamp, No. 500T10P, having a rated burning life of 25 hours, for use in 8-mm movie projectors; a 750-watt lamp, No. 750T12P, rated at 25 hours, for use in both 8- and 16-mm projectors; and a 1000-watt lamp, No. 1MT12P, rated at 10 hours, for use in 16-mm mechanisms.

## f/1.9 SUPER-SNAPLITE



Question Box

No. 2

#### WHY ARE SHORT FOCAL LENGTH LENSES USED FOR DRIVE-INS?

Where the projection room must be located near the screen, short focal length lenses are necessary to project large pictures. For this reason lenses with focal lengths from 2" to 3½" are usually used in Drive-Ins. The Kollmorgen Screen Chart shows the focal length needed for pictures from 9 to 85 ft. wide at 40 to 400 ft. throws.

#### DO SHORT FOCAL LENGTH LENSES GIVE HIGH QUALITY PICTURES?

Short focal length lenses for wide angle projection are quite difficult to design, but special attention was given to this phase in computing the Super-Snaplites.

#### DOES THE PICTURE PROJECTED BY A SUPER-SNAPLITE HAVE THE SAME QUALITIES IN ALL FOCAL LENGTHS?

Yes. Due to the unique design of the Super-Snaplite, the picture projected by a 2" lens shows as good definition, flatness of field and uniformity of light as with the more popular sizes such as 4" or 4½".

#### ARE THE SIZES OF THE VARIOUS ELEMENTS THE SAME FOR ALL FOCAL LENGTHS?

No—the elements are designed for each focal length and vary in size.

#### WHAT IS THE TOLERANCE IN FOCAL LENGTHS OF SNAPLITES?

Snaplite lenses are all within the tolerance of plus or minus 1% recommended by the Society of Motion Picture Engineers.

#### IN ACTUAL PRACTICE WHAT DOES THIS PLUS OR MINUS 1% MEAN?



It means that the actual picture size for any focal length lens will be within plus or minus 1% of the computed picture size. Thus if a 20 ft. (240") wide picture is desired, the actual projected picture might be 238" or 242" and still fall within the accepted tolerances.

"You Get the Most Uniform Light with Super-Snaplite"

**KOLLMORGEN**

2 Franklin Avenue  
Brooklyn 11, New York

*Optical*



**CORPORATION**

## Relative Toxicity of Nitrate and Acetate Film Stock

By DR. E. K. CARVER

Research Laboratories, Eastman Kodak Company

**R**ECENTLY IP posed the following question: "If acetate film should ignite, would it give off the same toxic fumes as nitrate?" The answer to this question is "no".

Acetate film is about like paper or wood in this respect, but is considerably harder to burn than either of them. No one likes to breathe acetate wood smoke, nor would they like to breathe acetate film smoke. One is about as bad as the other.

The toxic fumes from nitrate film are chiefly nitric oxides, although carbon monoxide is also generated. It is the nitric fumes which are insidious. Breathing them may bring on edema of the lungs many hours after exposure. The victim may not know of this danger and so may not seek proper medication until too late. Acetate film cannot give off these nitric oxides.

### Vital Difference in Characteristics

However, the chief danger from nitrate film is really caused by the large volume of fumes that can be given off rapidly

even in the absence of sufficient air to support combustion. If nitrate film were no more combustible nor more liable to decomposition than acetate film, there would be little toxicity hazard except

### All Kodak Projector Prices Slashed

Kodak's two popular 16-mm sound projectors—the Kodascope FS-10-N and the FB-40 projectors—have been reduced in price. The FS-10-N single-speaker unit has been dropped from \$500 to \$345. The twin-speaker unit formerly priced at \$565 is now \$395.

The FB-40 projector, which has the greatest undistorted watt output now available from a portable tungsten 16-mm sound-projection equipment, 40 watts, has been reduced from \$855 to \$585.

Both of these projectors are equipped with Kodak's unique fidelity tone control which assures the finest sound reproduction from all types of 16-mm. sound films—originals, duplicates, or reduction prints from 35-mm. And, like all Kodascope projectors, these two units are equipped with the exclusive field flattening element of their lenses which results in corner-to-corner sharpness on the screen.

under very special circumstances. It is the fact that nitrate carries its own supply of oxygen that really makes it hazardous. Acetate film burns very slowly and does not decompose at all unless there is an outside source of heat.

It is a bit difficult to understand why this point has come up. It would be possible, if some one were attempting to prove that acetate film were dangerous, for them to quote figures showing that if acetate film were roasted by some source of outside heat, it could be made to give off toxic fumes. This is also true of wood, paper, wool, rayon and many other materials which we do not ordinarily consider hazardous.

## BOOK REVIEW

AN INTRODUCTION TO COLOR, by Ralph M. Evans. 340 pages, 7½ x 10, profusely illustrated, including 15 color plates, indexed. \$6. John Wiley & Sons, New York; Chapman & Hall, London, or at all Kodak stores.

A completely descriptive and non-mathematical book on color, intended for all persons interested in the subject—including photographers, designers, interior decorators, artists, engravers, and many others—has re-

## You Sell

## A Picture On a Screen... Make It the Best with

## *Super Cinephor Lenses*



You invest heavily in a building, equipment, and personnel to sell one thing . . . a moving picture on a screen. You can't afford to skimp on that. Your screen images must be the finest . . . critically defined, uniformly brilliant, pleasant to look at. One way you can be sure that your screen images are the *finest* is to use Bausch & Lomb Super Cinephor projection lenses, the standard of excellence in the theatre field. Bausch & Lomb Optical Co., 616-C St. Paul St., Rochester 2, N.Y.

## BAUSCH & LOMB

OPTICAL COMPANY



ROCHESTER 2, N.Y.



cently been put on the market. The book, "An Introduction to Color," by Ralph M. Evans, Superintendent of Color Quality Control at Eastman Kodak Co., is, as its name implies, truly an "introduction" to the subject of color.

Color, according to the author, sprawls across the enormous subjects of physics, physiology, and psychology. However, the book has been written on the assumption that the reader has little or no knowledge of these three subjects, nor of more than high school mathematics. The text is set forth in consistent, understandable terminology and is profusely illustrated with explanatory graphs and charts and full-page color plates.

"An Introduction to Color" approaches the subject from the three aforementioned angles and then discusses the interrelationship of each. The type of material covered is indicated by some of the chapter headings—Color and Light, The Physical Nature of Light, The Physics of Everyday Color, The Visual Variables of Color, Color Perception, The Measurement of Color, Effects of Illuminants, Color in Photography, Color in Art, and Design and Abstraction.

"An Introduction to Color" is available through all Kodak dealers at \$6 per copy.

### 'Klenz,' New Optics Cleaner, Now Available Generally

To overcome impaired definition of picture screen image and sound reproduction there is now available a new and scientifically correct means for removing dust, dirt or any other foreign substance from lenses, condensers and mirrors. This new product, known as "Klenz," is sponsored by Essnany Electric Mfg. Co., of Chicago, makers of the Strong Zipper Changeover and other projection accessories.

Klenz works quickly and efficiently, with only a few drops being applied to any highly-polished surface and then wiped off with a soft cloth. Essnany warrants that this product is absolutely safe for use on the finest optics.

Now in progress is a wide-scale promotional campaign in behalf of Klenz, in which hundreds of 3-ounce bottles are being mailed to projectionists throughout the United States on a money-back-if-not-satisfied basis. Complete satisfaction is warranted for Klenz, or the price of \$1.50 will be refunded.

This trial offer of Klenz is available through Essnany at 1438 North Clark St., Chicago 10, the director of which is Clarence Jalas, secretary-treasurer of IA Local 110. Klenz will soon be available through all motion picture supply dealers.

### 'Pulse' System for Theatre-Tv Network Cited at IRE Meet

Use of city-wide Tv networks to carry spot news, special current events and other happenings from central depots to motion-picture theatres over special high-frequency radio channels set up for the purpose, was foreseen at the recent convention of the Institute of Radio Engineers (N. Y. City) as a "certainty within five years."

Such systems, operating on radar-like principles developed in the late war, not only

might be city-wide in scope but eventually might be used on a national or even international basis.

Emil Labin, engineer-director in charge of microwave operations at the Federal Telecommunications Laboratories (Nutley, N. J.) expounded this view of the future in radio communications after a convention session on new "modulation systems."

"Pulse" modulation systems," he said, "incur no distortion, no matter how extensive they may be," but could be carried on nationally or even internationally. Pulse modulation, he added, is the newest thing in radio modulation and is accomplished by "sampling" a program at a rate of millions of times a second and then transmitting the

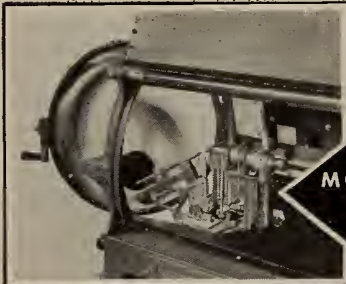
samples for a radio receiver to unravel.

He explained further that pulse modulation was not a new idea, but had been under development for years. Now, however, "it is just beginning to be appreciated." A single pulse station, he said, could carry as many as a dozen programs at the same time over a single radio spectrum assignment to receivers, which could be attuned in the home to any one of the programs.

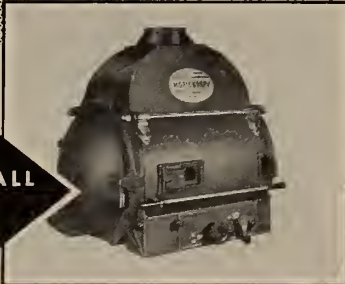
### Carbon Arc Picture Going Abroad

National Carbon Co. announces that its Technicolor motion picture, "Carbon Arc Projection," has been selected by the Office of International Information, Department of

## HERE'S THE INCREASED LIGHT YOU'VE WANTED FOR DRIVE-IN & LARGE INDOOR SCREENS



**THE  
NEW  
MOTIOPHOTOGRAPH-HALL**  
75/115 AMPERE  
HIGH INTENSITY  
REFLECTOR  
TYPE ARC  
LAMP



Operating at 85 amperes, the Motiograph-Hall produces 19,000 lumens—more light than condenser-type high intensity lamps operating at more than twice this amperage.

A rotating positive carbon (an exclusive feature) permits even burning of the carbons and a proper crater form.

Due to the extremely high intrinsic brilliancy of the Motiograph-Hall arc, the total light output contains a much larger percentage of visible light, making unnecessary the use of a filter which would reduce the amount of visible light passed.

The automatic focus control, another exclusive feature, constantly holds the crater of the positive carbon at the exact focal point of the mirror, preventing variations in the character of the light at the screen.

The Motiograph-Hall lamp is designed to use 9-mm. or 11-mm. high intensity positive carbons and 5/16" negative carbons, the cost of which is about one-third that of the cost of the larger carbons used in condenser-type lamps operating in the 140-180 ampere range.

Other Motiograph products include Motiograph 1 K.W. and 46-ampere high intensity arc lamps, Motiograph projectors, indoor and outdoor sound systems, generators and rectifiers, in-car speaker equipment and junction boxes, ramp switching panels for drive-ins, turntables, etc.

Literature and Complete Information May be Obtained from

**MOTIOPHOTOGRAPH, INC., 4431 W. LAKE ST., CHICAGO 24, ILL.**

State, for distribution throughout 52 foreign countries and their dependencies. Films so distributed comprise documentary and informational subjects covering many aspects of American life to be shown in non-commercial theatres, without admission charge, to foreign audiences totaling over 100 million persons a year.

"Carbon Arc Projection" demonstrates the optics of motion picture projection, what the carbon arc is and how it operates, and explains why this light source has the brilliancy and color balance ideally suited for motion picture production and projection.

The picture is educational and entertaining not only for motion picture technicians but also for schools, universities, etc.

## IN THE SPOTLIGHT

(Continued from page 19)

electrical branch of the Navy during World War I, and upon his discharge he became associated with the Paramount Studios in Hollywood, where he has remained ever since.

- Eddie Miller, IA representative and business agent for Houston Local 279, successfully concluded negotiations for the Texas Locals (District No. 6), obtaining for each Local a flat 15% wage increase, retroactive to September 1 last; two-week vacations with pay; ad-

justments on overtime rates, and increases for midnight shows.

- Bill Keeler, newly-elected business agent for San Antonio Local 407, brings to his office a wealth of experience. Business agent of the Local about 20 years ago, Bill has at his finger tips all the whys and wherefores so essential to an efficient and able union official.

- Thomas Smale, member of Detroit Local 199 and projectionist for the past



Thomas Smale

10 years at the Van Dyke Theatre, is another IA man who has risen high in the order of Masonry. He was raised in Daylight Lodge No. 525, F. & A. M., back in 1929, and since then has been accorded many Masonic honors. In 1945

the Michigan Council of Deliberation, the governing Body of the Rite in the State, conferred upon him the Meritorius Service Award in recognition of his many contributions to the Rite. In September 1948, at Boston, he was elected to receive the 33rd degree and to Honorary Membership in the Supreme Council, both of which will be conferred upon him at Chicago next September.

Smale began his projectionist career in 1912 at Windsor, Ont., Canada. After serving with the Canadian Army in World War I, he returned to Windsor and organized Local 580, becoming its first business agent. He served three years as business agent of the Local and one year as president. Later he moved to Detroit where in 1929 he joined Local 199.

### 'Arctic Blanch' Screen Refinishing

Sole ownership and direction of National Theatre Screen Refinishing Co., of Buffalo, is now vested in Ken Caldwell, one of the original partners in the "Arctic Blanch" screen reconditioning process. Caldwell, a member of Buffalo Local 233, emphasizes the fact that this process is not even remotely intended to delay the purchase of a new screen but rather to improve materially projection when the purchase of a new screen is not feasible.

That the Arctic Blanch reconditioning process makes a "whale of a difference" in the image projected to any screen that has been in use for some time, Ken offers to prove by means of a pamphlet containing testimonials from scores of satisfied users in theatres of all classifications. Address 129 Zenner St., Buffalo 11, N. Y.

## THE STRONG TROUPEUR

*Portable High Intensity*  
A. C. CARBON ARC SPOTLIGHT



for theatres, auditoriums and night clubs where the length of throw does not exceed 100 feet.

PRODUCING A SNOW WHITE uniformly illuminated spot, crisp on the edges, the Troupeur will supply that essential sparkle to a presentation that is obtainable only with the use of high intensity arcs.

FAR SURPASSING IN BRILLIANCY of spot any incandescent or vertical arc type spotlight, the Troupeur will actually equal many of the large theatre type spotlights.

ENGINEERED WITH AN EYE toward simplicity and ease of operation, this spotlight is capable of being easily operated by a "new" man on "opening night".

THE OPTICAL SYSTEM utilizes a silvered glass reflector to collect the illumination from the source and direct it to a circular aperture, from where it is projected to the stage by means of a two element variable focal length lens system.

FOR A 60-FOOT LENGTH OF THROW, the size of the projected spot is variable from a minimum of 30 inches "head spot" to a maximum of 33 feet "flood".

EXTREMELY MODEST IN ITS POWER requirements, this spotlight draws only 10 amperes

from any alternating current 110-volt convenience outlet.

A HIGHLY EFFICIENT, adjustable and self-regulating transformer which is an integral part of the spotlight base reduces the 110-volt alternating current supply to a low arc voltage and for the first time makes possible a high intensity arc spotlight without the use of heavy rotating equipment.

THE CARBONS ARE FED AUTOMATICALLY by an electric motor which maintains a constant arc gap. This results in a steady light, free from hiss or flicker.

A TRIM OF CARBON consists of two 6mm x 7" heavy copper coated high intensity carbons with a burning time of one hour and twenty minutes at 21 volts and 45 amperes arc current.

A HORIZONTAL MASKING CONTROL can be angled at 45 degrees in each direction from horizontal.

THE COLOR BOOMERANG contains six slides and an ultraviolet filter holder.

MOUNTED on casters. Easily disassembled into two units for shipment.

SOLD BY INDEPENDENT THEATRE SUPPLY DEALERS.

Use the coupon to obtain further details, prices and name of your nearest dealer.

**THE STRONG ELECTRIC CORP.**

"The World's Largest Manufacturer of Projection Arc Lamps"

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TOLEDO 2, OHIO

Please send free literature, prices and name of the nearest dealer in Strong Spotlights.

NAME .....  
COMPANY .....  
STREET .....  
CITY and STATE .....

## New Film Cabinet Features a Built-in 'Waterfall'

The seething 1500-degree heat of flames from kerosene-soaked pine kindlings failed to damage 24,000 feet of nitrate film in a new motion picture film storage cabinet which was tested recently in the open air at Washington, D. C., it was announced by John G. Bradley, who developed the cabinet. Although the blazing kindling surrounded the cabinet, exposing all sides of it to the intense heat, the temperature inside the cabinet was not raised above approximately 70 degrees. Cans of film removed from the cabinet immediately after the test were handled by observers and described as "cool as a cucumber."

In a second test, one of the 24 cans of film was ignited by means of a heat coil, charged electrically through an external wire connection after the cabinet was closed, and while the 1000 feet of film in the single can was completely destroyed, film in the remaining 23 cans was unaffected.

### Each Film Can Doused With Water

The principle which makes the cabinet fireproof and virtually heatproof is a built-in "waterfall" which immediately covers each can of film with flowing water in event of fire either inside or outside the cabinet. Known as a "water-seal cascade" type of film storage cabinet, it is expected to find application in theatre projection rooms, film libraries, production studios, etc.

The cabinet, patented for Mr. Bradley by the Federal government, with the latter retaining right of use, is constructed to hold the cans of film horizontally, to avoid seepage of water into the cans when the sprinkler system is in operation. The present design, and probably average commercial size, is for 24 cans, each holding 1000 feet of film.

## Slant Lines Held Less Visible

Two Kodak scientists studying the sharpness of vision have come up with an experiment you yourself can try with your daily newspaper. The two researchers, George C. Higgins and Keith Stultz, found that the visibility of parallel lines in a test object used in their experiments is 10 to 20% lower when the lines were viewed at an angle of 45 degrees to the horizontal. The lines are that much more difficult to see when turned at that angle.

You can easily see this effect when you look at a newspaper halftone picture, which is made up of rows of tiny dots and serves very well as a test object. Turn the newspaper picture halfway to the right or left so that the lines of dots are either vertical or horizontal. The result, if you have the picture at average reading distance and if it is of moderate density, is that you will see the lines stand out in the picture.

### Marked Change Visible at 45° Angle

By turning the picture back to normal position, so that the lines of dots are at an angle of 45 degrees to the horizontal, the systematic array of dots disappears. There is marked increase in the clarity of the picture. This is one of the reasons that newspaper halftones are usually made with

the two sets of parallel lines passing diagonally rather than vertically before your eyes.

This is believed to be the first time, however, that scientific data has been reported on the variations of visual sharpness measured with test objects consisting of parallel lines passing at different angles before the eyes of the observer. The work at Kodak Laboratories is part of a general study of vision and its relation to better pictures.

## T-NUMBER vs. F-NUMBER MARKS

(Continued from page 17)

the *F*-number of an ideal lens, of circular aperture and 100% light transmission, which would give the same axial image illumination as the actual lens at the specified stop opening.

In short, the old *F*-number gave the purely dimensional ratio of focal length to diameter of a lens, but ignored variations in transmission of light; whereas the *T*-number defines the same ratio modified in accordance with the light transmission of the lens, and thus renders



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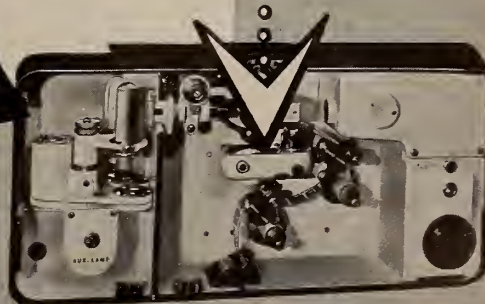
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possible exact comparison between rapidity (speed) of lenses.

Well, one will say, that is all to the good: we want the greatest possible accuracy in all our instruments of precision. . . . It is not quite as simple as that, for the tendency of the moment—having its origin, it should be pointed out, with the motion picture industry of the U. S. A.—is to use the *T*-scale not as an adjunct to the *F*-number but to replace it.

#### Serious Inconvenience Cited

Now, such a procedure may cause quite a little inconvenience to serious workers in several photographic spheres, and before any final decision is arrived at,

and certainly before any decision is made binding upon all lens manufacturers, we should like to suggest that very careful consideration be given to the matter. We have in mind especially the question of lenses for process work and for color photography, the latter particularly in relation to record work of a scientific nature.

It must not be forgotten that the coating of lenses does affect the spectral reflectivity of the lens faces, and that in the case of the commonest treatment given in this country—i.e., a coating of magnesium fluoride—the lens finishes up with an appreciably greater transmission in the centre of the visible spectrum—that is, in the yellow-green—than at

either the violet-blue or the red end of the spectrum.

That there may be as much as 2% less transmission at 4000 Å than at 5600 Å per single lens surface is surely a warning that there are many facets of this matter that require the most careful consideration, and that we certainly want very much more experimental study and accumulated data before any final decisions are arrived at.

#### Other Important Aspects

Another most important aspect that must not be overlooked is the fact that the *T*-number seeks to standardize the *rapidity* (speed) of a lens to the exclusion of other, and more fundamental, constants. In particular, in a world of lenses from which the *F*-number has been banished, all our depth-of-field tables and calculations will cease to have any precise meaning: they will become inaccurate by precisely the degree by which our rapidity measurements will have gained in accuracy; and it must be borne in mind that a 25% error in depth of focus is quite an important thing to the technical worker.

On the other hand, it is a fact that—outside color photography and certain scientific work—it is impossible to detect an error of exposure of much less than 25%, so that the vast majority of photographers would never know, so far as their exposures were concerned, that their *F*-numbers had become *T*-numbers if they had not been so marked.

Furthermore, every time a lens was cleaned—tenderly wiped though it might be with lens tissue—its *T*-number would be altered; whereas even the forceful wielding of a saucepan-scraper would not avail to change the *F*-number, which is based upon unalterable constants.

And, incidentally, is it reasonable to suppose—having regard to the inherent delicacy and relative uncertainty of lens coating—that lens manufacturers will wish to be saddled with the additional unwelcome burden of guaranteeing, by engraving *T*-numbers within a fairly close tolerance, the efficacy of their coating for an unspecified range of wave-lengths, together, presumably, with the obligation to supply a statement as to the variation of the *T*-factor according as non-color-sensitive or hyperpanchromatic material is used with it?

#### Favors Retaining *F*-Number

Surely the obvious course is to stick to *F*-numbers and to supply with each lens, if desired, a calibration chart giving the *T*-factors for a range of wave-lengths by which all exposure must be corrected. This will satisfy the specialist—who will thereby be better served than the engraved *T*-numbers, since he will have the

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advantage that he really will know what he is doing—without sacrificing any fundamental principles or disturbing the equanimity of the ordinary user, who, frankly, doesn't want to be bothered with hair-splitting refinements.

The desire for greater accuracy is laudable, but the value of that greater accuracy will be greatest in scientific work and in the process studios, and it is just in those spheres that the selective reflectivity we have mentioned will play the largest part, and possibly prove to be of the greatest inconvenience.

Let us use every means of progress possible, but before making decisions let us be sure that we have explored all the possibilities and weighed all the advantages and drawbacks, both to every class of user and to the manufacturers.

[NOTE: Comment on the foregoing evaluation of T-numbers and F-numbers is solicited by IP, particularly from manufacturers of optical products.—Ed.]

## THEATRE TV PRESENT STATUS

(Continued from page 12)

only 80 watts. With a screen efficiency of 5 candlepower per watt this represents a light output of 400 candlepower.

### Optical System Efficiency

The familiar refractive projection optics used in motion picture film projectors deliver approximately 6% of the light from the arc-light source to the screen. On the other hand, the reflective optics developed for Tv vision deliver 30% of the light output from the cathode-ray tube to the screen.

Reflective optics have been designed for large-screen projection of pictures up to 18 x 24 feet. One system for a 7½ x 10-foot screen uses a 21-inch mirror, a 14-inch "lens" (correction plate†), and a 7-inch, 50-kilovolt, cathode-ray tube. The largest system built so far consisted of a 42-inch mirror, a 26-inch "lens," and 12- and 15-inch projection tubes operating at 80 kilovolts. The throw was fixed at 40 feet, and by changing the cathode-ray tube either a 15- x 20- or an 18- x 24-foot picture was shown.

The magnification is fixed by the mirror radius. High present production cost of large-mirror systems seemingly indicate the advisability of concentrating on smaller optics and increasing the voltage capabilities of smaller cathode-ray tubes (7-inch) in order to make a compromise system which might be successful commercially.

The viewing screen forms the third and final optical element of direct-projection Tv. Standard motion picture screens have a diffuse surface which distributes the light more or less uniformly in all directions. Since the distribution is nondirectional, a great deal of light is lost to the ceiling and floor. Directivity, if it could be obtained in the vertical plane, would concentrate the light where it would be most useful and effect an important increase in efficiency.

### Lenticular Screen Test Successful

Beaded screens have been made to control the direction of the reflected light from the screen, but the directivity pattern, while showing a gain of 2, restricts the horizontal reflective pattern and tends to reflect a great deal of illumination back into the optical system where it reduces the contrast of the projected image. Developments in directional screens now underway promise gains as high as 3.

A lenticular screen of this type was successfully used in the Fox Theatre in Philadelphia where a 15- x 20-foot pic-

ture was shown featuring the 1948 Louis-Walcott fight. This screen is embossed on an aluminized surface, with small convex-lens elements to control the directivity pattern. The observed results

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† See "Basis of the Schmidt Optical System," IP for September, 1948, p. 8.

were excellent, and a gain of  $2\frac{1}{2}$  times was measured.

Such is not the case with a normal translucent screen (rear projection), since the light comes from a relatively small source and is a diverging cone of light at the screen. (The usual translucent screen receives direct rays which are normal to the center of the screen

but diverge nearer the edges, resulting in a bright spot in the center of the screen.)

A field lens can be used on the rear of the translucent screen to direct the rays in a parallel pattern, and hence give more uniform illumination over the entire screen, or by a modification the pattern may be made to suit almost any application. Such a field lens may be applied only in small screens as in the home type of projection receiver where a molded-plastic screen can be used. A compromise screen of high-density translucent material can be made, but the gain will be low and the directivity pattern becomes very sharp.

#### Equipment Elements, Location

The current design trend for direct-projection systems is to break the equipment into several discrete units: 1. The optical housing containing the mirror, lens, cathode-ray tube and its associated deflection coil, and a cooling system for the cathode-ray tube; 2. The control console containing the critical Tv elements such as the video amplifier and deflection circuits as well as the operating control panel; 3. The auxiliary power equipment consisting of a power-supply rack and a high-voltage power unit.

Various locations have been suggested and tried for this type of projection-Tv equipment. The present throw limitation makes the normal booth installation impracticable. Longer throw systems up to 65 feet can be made, but again the cost and size factor rule them out. Rear projection might seem ideal for short-throw systems, but the screen directivity is too sharp to make this practicable.

If it were economical to waste a great deal of light on a very dense screen, there might be some compromise possible in this direction. Another important consideration in selecting the location is the projection angle, because the limited depth of focus of the short optical system demands operation with the screen normal to the projection axis.

The installation requirements are

peculiar to the optical system employed and ideally would locate the optical housing on the front of the balcony. Alternatively, in a nonbalcony house the optical housing may be located either on a special ceiling suspension or in the orchestra. The control console should not be more than 15 feet from the optical housing because of circuit requirements, which usually dictate its placement at the balcony rail.

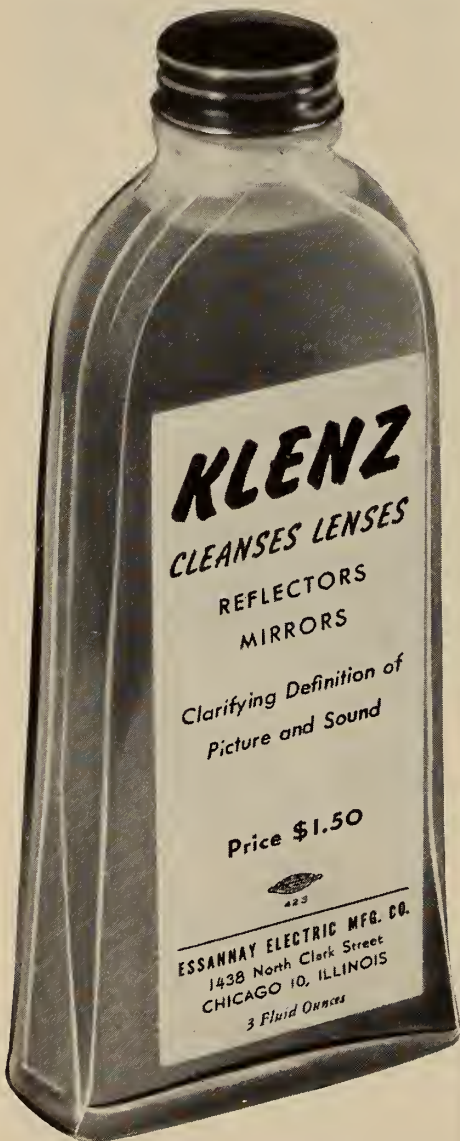
The balance of the equipment can be remotely placed at any convenient point, but cost will probably indicate a location less than 100 feet from the optical housing.

#### Picture Quality vs. Resolution

Picture quality from large-screen Tv projectors is now limited by the quality of the transmitted signals. The capabilities of the projection system are equal to the best studio equipment and any deterioration of the signal between the camera and the projector causes an inferior picture on the screen. Experience has shown that with a picture of suitable quality it is possible to produce results acceptable to critical audiences.

Present transmission of Tv pictures on standard channels is limited in bandwidth so that the projected pictures actually have about 300 lines resolution. If the pictures were transmitted by microwave relay, the entire capability of the projection system of approximately 350 to 450 lines could be utilized.

A Tv system specifically designed for theatre use will no doubt be a private system using ultra-high-frequency channels, and all of the equipment and techniques of operation will be improved to



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### Storage-Projection Methods

Two basic image-storage Tv projection systems are being investigated. The first uses motion picture film as the intermediate storage medium, while the second employs electronic means.

The film-storage method of large-screen Tv projection is the only storage system available even on an experimental basis in this country. The system described here was developed by Paramount and has been used on several occasions in the Paramount Theatre, New York City. The fundamentals are similar in many respects to equipments designed and built by others and may give the motion picture industry an insight into the problem involved in setting up such a system.

The film-storage system consists of four basic elements: 1. Tv receiving equipment; 2. recording camera; 3. rapid film-processing equipment; 4. a conventional 35-mm motion picture projector. In practice, Paramount has used mobile cameras together with microwave radio-relay equipment to bring the program material to the theatre.

The mobile cameras with associated control equipment and microwave-relay unit are of the conventional type used by Tv broadcasters for remote pickup and cost approximately \$55,000.

All receiving equipment\* is housed in one unit. This includes all video and audio equipment together with high- and low-voltage supplies. Two screens are provided. One employs a 15-inch cathode-ray tube for monitoring; the other is a 10-inch cathode-ray tube having an aluminum-backed, flat-face screen. This 10-inch cathode-ray tube is of the blue, short-persistence type and provides the received image which is photographed. This screen has the polarity reversed and the received image is a negative. Audio portions of the program are monitored by a loudspeaker included in this unit.

### Camera, Processing, Power

A special recording camera is employed having no mechanical shutter but having its pull-down mechanism synchronized at the standard film rate of 24 frames per second with an electronic shutter incorporated in the circuits of the 10-inch cathode-ray tube. Twenty frames following exposure of the picture the film passes through the sound modulator. A film magazine mounted directly above the recording camera holds sufficient unexposed film for two hours continuous recording.

Exposed film from the recording camera passes through a chute directly to a high-speed processing unit. A maximum of 66 seconds is required to de-

velop, fix, wash, and dry the exposed film. Facilities are provided either to wind the processed film on reels or feed it directly to the projectors.\*

The processing unit requires a hot- and cold-water supply of approximately 20 gallons per minute. The hot-water supply must have a minimum temperature of 140°F. Cold-water supply at con-

\* The total cost of these three units (receiver, camera, and processing unit) is approximately \$35,000 plus installation.

ventional tap temperature is adequate. Automatic mixing is provided within the unit to attain a resultant temperature of approximately 125°F. A slop-sink should be provided for disposal of spent photographic chemicals.

The total power required to operate the three units (receiver, camera, and processing) is 100 amperes, 3-phase, 208 volts a-c.

The space required to house the re-



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ceiving, recording, and processing units is 200 square feet. To facilitate operation and maintenance, a room 10 x 20 feet is recommended with the equipment set up in a straight line allowing at least a 2-foot aisle on all sides.

### Electronic Storage Methods

Equipment in this category is not currently available for use in American theatres and it does not appear that such equipment will be available in the immediate future.

Two basic systems merit attention. The first uses the dark trace or Skiatron types of screens which are known in the American market as P-10 phosphors. Manufacturers in this country do not plan in the near future to market a tube which has the proper characteristics for Tv, and some of them express the opin-

ion that this screen is not feasible for such use.

This fact is, of course, well known to the industry from the results of published research by many independent investigators as well as the engineers from some of the companies contacted in this survey. Generally speaking, the Skiatron tube at present produces an image which does not permit sufficient contrast and low persistence to compete successfully with phosphorescent screens or with photographic emulsions. It is also difficult to produce a screen which produces true black and whites.

Similarly, its decay time is a complex phenomenon, and although it can be controlled to some extent in manufacture, satisfactory performance in this regard has not been obtained to date. It is entirely possible, however, that future developments may reverse present thinking in this regard.

### Swiss Storage, Large-Screen Method

The second storage system is known as the AFIF Method of Large-Screen Television Projection. It was developed in Switzerland by Dr. F. Fisher at the Swiss Federal Institute of Technology. Since it was known that this system was

not currently available for sale, no contact was established with the Institute.

A laboratory model of a theatre projector using this system was demonstrated in Zurich, Switzerland, during the week of September 5, 1948. Eye-witnesses report that screen brightness was equivalent to present motion picture practice and picture definition was adequate for theatre use. The demonstration was conducted, however, using 729 lines rather than 525 currently standard in the U. S. A.

### Summary of SMPE Report

It is clearly evident that theatre-Tv equipment has been developed which is capable of providing pictures of continuing entertainment value. While not equal in quality to present 35-mm film, evidence has been presented which indicates such quality will be approached in the future. Methods of distribution of program material by coaxial cables or radio channels also have reached a stage of development where satisfactory Tv pictures can be transmitted over necessary distances.

Further development of equipment as well as provision by the FCC of suitable radio channels is now mainly dependent upon the interest shown by the motion picture industry. Active participation by theatre owners and related organizations is essential if the opportunity to use this new medium is not to be lost.

The FCC, however, does not grant channel allocations on a vague request that they may be needed at some future date. Concrete evidence must be presented that the group requesting such allocations is prepared financially and technically to provide a service in the public interest. Only by such action can it be hoped that the request will receive favorable consideration.

The r-f spectrum is very rapidly becoming overcrowded. If the motion picture industry ever hopes to use Tv in the theatre, action must be taken now. A year from now may be too late. Producers, distributors, and exhibitors alike must unite and approach the FCC with a well-formulated plan that they seriously intend immediate experimental operation.

[NOTE: Copies of the complete report, including much additional data relative to governmental regulations and to various facilities for transmission of programs, with costs thereof, are available in booklet form at 75 cents per copy. Address the SMPE, 342 Madison Avenue, New York 17, N. Y.]

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## 'MATCHED' PROJECTION OPTICS

(Continued from page 9)

jection equipment are completed, *specific* recommendations should be issued. Until such recommendations are made, projectionists and lens manufacturers will be all but powerless to institute further improvements in the optical phase of projection.

Why not employ the exact matching speeds instead of arbitrarily assigned optimum speeds which, at best, fall below ideal conditions? The practical difficulties of manufacturing and using extremely large lenses are serious, almost insuperable obstacles. Lens designers would find their skills taxed to maintain the necessary flatness of field and depth of focus. A host of troubles would descend upon the projection room, too, for the lens mount assemblies of many projectors would be too small to accommodate the barrels of the largest lenses.

Nevertheless, it is entirely possible that high-quality  $F:1.5$  lenses could be produced successfully in the shorter focal lengths, and these could be used in most theatres with gratifying screen results.

Regardless of possible future innovations, the principles of matched optics plainly indicate the desirability—yes, the necessity—of using nothing less than the most rapid high-grade lenses available at the present time. The soundness of this recommendation cannot be disputed, yet thousands of theatres are still plodding along with outmoded low-speed lenses.

### Vignetting Effect in Lenses

Optical experts have long been concerned with the so-called vignetting effect of projection lenses. This is a pronounced drop in screen illumination at the edges of the picture, and is especially prominent when the older, low-speed lenses are used. When the lamp is known to illuminate the aperture evenly, the cause of the vignetting effect must be sought in the design and dimensions of the projection lens.

In most cases the nature of the light beam pouring through the aperture is a contributing factor. The central portion

of the lens "look," through the aperture and "sees" the arc lamp mirror or condenser beyond as a large disc of intense light. Ordinarily, however, the blazing disc does not appear quite as large as the condensing element to the "eye" of the lens, hence the bright disc is surrounded by a comparatively dark ring.

Now, the edges of the projection lens "see" the opposite edges of the condensing element through the aperture. To the edges of the lens, however, the edges of the mirror or condenser are not dark at all but appear intensely bright! This shift of the magnified crater image with a shift of viewing point (on the surface of the lens) is due in part to aberrations of the curved "figure" of the mirror or condenser. (These aberrations also help produce the "bend," or bottleneck form, of the light beam from a projection lamp.)

When a film is projected, the center of the projection lens "sees" a film picture which is very bright in the middle but dim at the edges. The edges of the lens, on the other hand, enjoy a rather different view of the picture. To them the overall illumination is less than it is to the center of the lens, but the edges of the film picture are the brightest parts of all.

The several regions of the lens pass

their "views" of the film picture to the screen where a highly magnified composite image is formed. The central portion of the screen image comes largely from the central portion of the lens, and the edges of the screen image come




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chiefly from the outermost edges of the lens.

Here is the important point. If the projection lens be one of those slow "gay 90's" models, it will fail to catch most of the light illuminating the edges of the film picture, and the screen image will be deprived of anything the lens is unable to "see". The result is a decided vignetting effect with a "hot spot" in the center of the screen. So we see that the more closely our lenses are matched to the optics of your lamps, the more evenly illuminated will be the picture we project.

### Eliminating the 'Hot Spot'

It would seem feasible to overcome unavoidable, residual vignetting (due to the impracticability of using *perfectly* matched optics in most instances) by deliberately over-parabolizing the figure of the lamp mirror or condensing lenses. The effect would be an intensification of edge brightness of the film picture in the aperture. The vignetting effect would thus be neutralized by an opposing "error" of the lamp system, and the screen image would be smoothly illuminated.

The same effect could be obtained by the interposition of a specially figured "compensating lens" behind the aperture, but the light loss in a lens made of heat-resistant glass might be considered too great to be tolerated.

Action by the SMPE on this important matter would seem to be definitely indicated. The "hot spot" has devilled projectionists for all too long!

The matter of light dispersion from

silver grains in film emulsion appears to have little bearing on picture illumination. I cannot find an appreciable effect in the screen image which can definitely be attributed to dispersion. It is of interest to note that dispersion is absent in Technicolor and other imbibition-process prints.

### Ultra-Sensitive Photo Emulsion Requires Shipment in Dry Ice

A new photographic emulsion for tracking down atomic particles is so sensitive its producers are faced with the problem of how to prevent its premature exposure by cosmic rays during shipment to research workers. The new emulsion, developed in Kodak Laboratories, is approximately four times as "fast" as the company's existing nuclear track plates. It has successfully recorded electron tracks which are ten times longer than those previously captured photographically.

Protection of the new material poses a problem for Kodak scientists. No sooner is the new emulsion made than it begins to record the bombardment of cosmic rays which strike all about us constantly from outer space.

### Intense Cosmic Ray Barrage

Dr. Cyril J. Staud, director of the laboratories, said that "about six electrons from cosmic rays strike each square cm. of the emulsion every minute." This intense barrage, he pointed out, peppers the emulsion so much in three days time that, unless adequately protected, it is clouded with background streaks upon development.

Packing the emulsion in dry ice for shipment may protect it, Dr. Staud indicated, because the emulsion's sensitivity is reduced



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at low temperatures. On arrival, it could be refrigerated and later permitted to warm up just before exposure.

Dr. John Spence, in charge of research on the new emulsion, said that it "comes very close to complete recording of any nuclear particle." He said the emulsion is characterized by a uniform sensitivity of all its tightly-packed grains and a high concentration of silver halides. Commenting on its importance as a photographic tool in nuclear research, Dr. Spence explained that an atomic particle in the emulsion acts like a "skipping stone" on the surface of a pond.

### Procedure for Computing Data

"Assuming one has a good, round disc-like stone and throws with precision," he said, "the frequency of the skips increases toward the end of its path. The faster the stone is traveling, the less the frequency of the skips in the water. This is paralleled by the passage of a high-energy particle through a nuclear emulsion. As with the skipping stone, the rate of energy loss is reflected in the number of grains along the track."

From the length and curvature of the track and the grain-spacing along it, he said, information is obtained of the particle's speed, energy, and other characteristics.

The emulsion can also bring new precision to autoradiography in medical research, Dr. Spence added. In autoradiography, sections of tissue containing radioactive isotopes are placed in contact with the emulsion. The specimen takes its own picture when radiation from its tissue exposes the emulsion. Examination of the developed plate enables scientists to identify the location and amount of radioactive penetration in the tissue.

The new material has been made so far only on an experimental basis and is not yet generally available.

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complete, compact compilation of everyday problems encountered in the projection room, and contains sound practical suggestions relating to their causes and how to remedy them. All items are grouped according to classifications, and many of them are illustrated with schematic diagrams.

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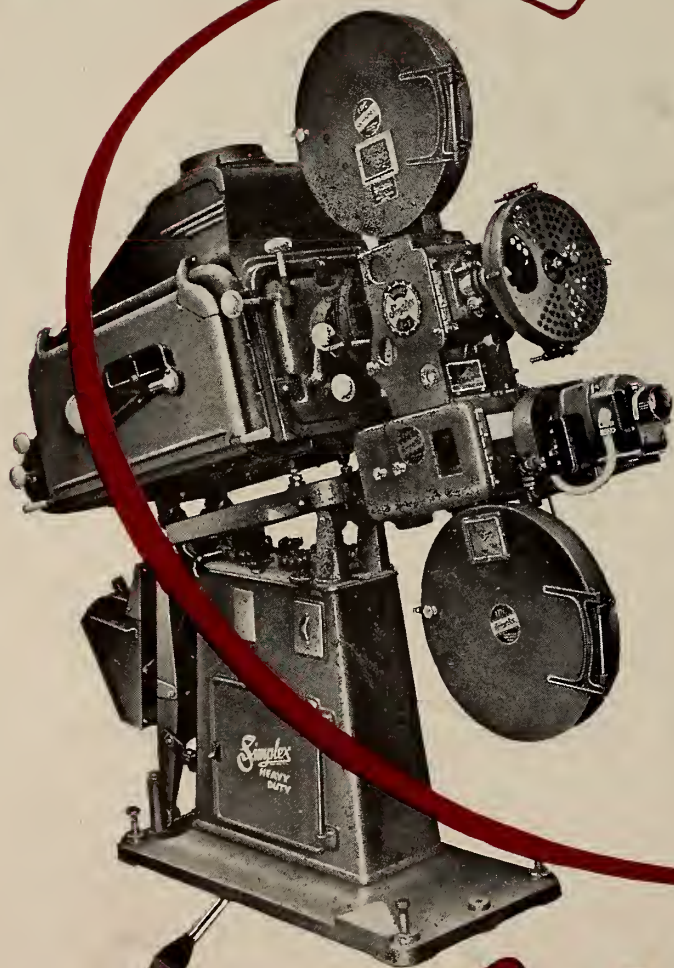
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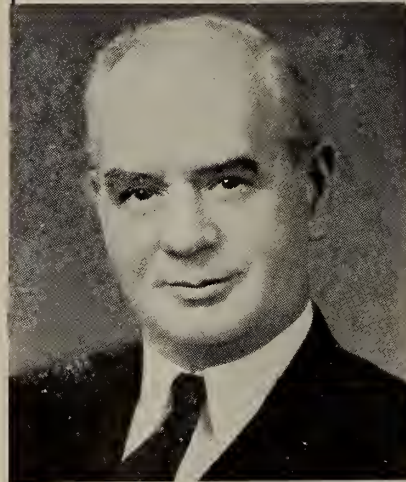
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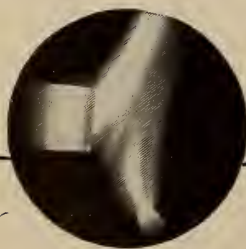
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HENRY B. SELLWOOD, *Editor*

Volume 24

APRIL 1949

Number 4

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## MONTHLY CHAT

TO THOSE still cherishing the illusion that motion pictures is a static art, with all the technological returns being in and with every prospect that the future will witness no radical departure from existing equipment and technique, the proceedings at the recent SMPE Convention would prove an eye-opener. Particularly is this true of the exhibition field, wherein not only brand new processes but a radical change in equipment and technique are forecast.

Most interesting to us was the frontal assault made by the 16-mm boys on the 35-mm citadel. No longer content with the more or less self-imposed restriction as to frequency range, the 16-mm people took the wraps off product which visually and aurally would give a good 35-mm picture a tough tussle. We may expect to see a gradual extension of 16-mm application to the professional field, with reduction prints finding increasing application.

Let us not forget that the bulk of motion picture theatres have less than 1000 seats, however much publicity accrues to the de luxe operations, and it is in the former classification that the 16-mm people will make their most strenuous efforts.

Then there is the matter of tape recording and reproduction. Already extensively used in the studios, it wouldn't surprise us at all to witness an expanding use for this equipment which would precipitate it right into the theatre field. Quality-wise, this tape process is at least as good as the best film recording. Just what form this application will take is not clear at the moment, but if stereophonic sound ever comes into its own, then this tape will really go to town.

Television, of course, was the big noise at the Convention, and while it was obvious that much improvement has been effected in both equipment and technique during the past half-year, we still are a bit hazy as to just where Mr. Projectionist will fit into the general scheme of things. It is by no means certain that the Tv equipment will be installed in the projection room, which means that considerable tugging and hauling jurisdiction-wise is almost inevitable. Due for revival is the old saw about "qualified engineering personnel," which may be freely translated into one term: non-union.

Yes, indeed, the technological pot is boiling (there are other developments which still are in the "mum" stage but which are virtually set to go); and whatever course is followed in introducing these developments, the projectionist craft has the two-sided task of preparing itself by acquiring technical savvy as a means of protecting those interests which they have built up so arduously through the years.

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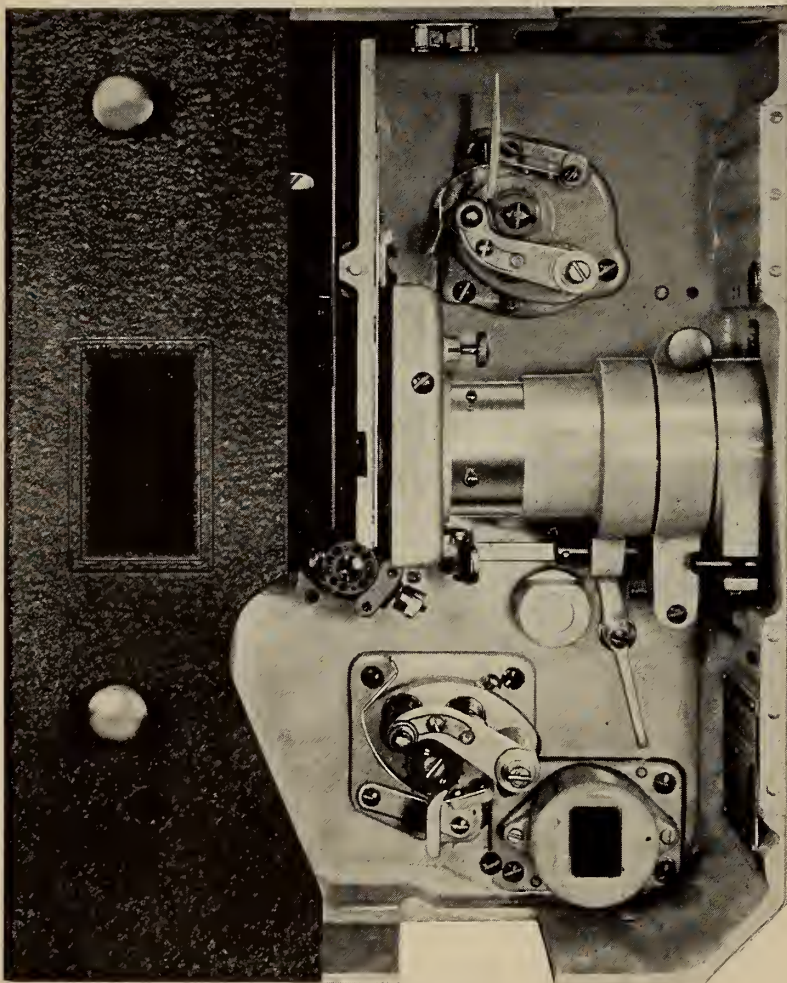
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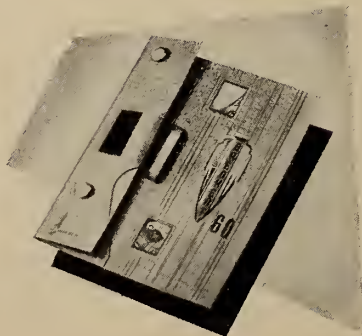
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## Projection Preparations for the 'Seasonal' Theatre

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**T**HE term "summer theatre" when used in connection with motion pictures denotes an exhibition operation providing screen entertainment during the summer vacation season. These operations may be divided into three main classes:

- (1) "Permanent" theatres which are operated only during the summer months because winter operation is unprofitable.
- (2) "Temporary" motion picture installations, among which are found open-air tents, concert halls, and dance pavilions pressed into service as cinemas.
- (3) Drive-in theatres.

Drive-in theatres are usually permanent in that the projection equipment is not removed at the close of the season. The "temporary" venture often employs motion pictures as a filler for open dates between concerts and stage shows. The "permanent" type of summer theatre is the most conventional, but the presentations consist largely of first-run, top-quality productions on single-feature bills with selected short subjects.

The operational policy, in general, is conservative and dignified.

Projectionists in most summer-resort theatres are required to close down at the end of the first evening show for an intermission—a convenience for waiting second-show patrons who find that a

By **ROBERT A. MITCHELL**

*This article, although pointed at the 'seasonal' theatre, is applicable in almost all particulars to any type of motion picture projection installation. In fact, it is an invaluable guide for a general overhaul of all such facilities.*

"preview" of the last few scenes of the feature picture spoils their enjoyment of the show. Starting times of shows are seldom delayed, except in the case of reserved-seat performances.

Flawless projection is expected at all times, of course, but the "unseen showman" is all too frequently handicapped by worn and obsolete equipment.

### **Reopening Tasks Formidable**

A truly formidable number of tasks await the projectionist who must open a theatre which has been closed for a considerable length of time. To neglect any of them is to invite film breaks, light failures and sound-system troubles. The skill, experience, and reputation of the projectionist are put to the test of pre-conceived standards from the outset. Failure to achieve acceptable screen results will discredit him. Ample time

must be allowed to line up the projection and sound equipment prior to opening.

Certain legal aspects of such operations affect the projectionist and must be considered before anything else. No matter what the type of theatre, its projection facilities must meet the specifications of State and municipal ordinances. At the present time Connecticut, Maine, and Massachusetts are the only states in New England having comprehensive theatre laws and requiring the licensing of projectionists. New England has a large concentration of summer theatres. Examinations for projection licenses cover the following six points:

- (1) Handling of the head, lamp, appliances, and wiring of the projection equipment.
- (2) Practical testing for electrical defects in the lamp and wiring in the projection room.
- (3) Use of the safety appliances in the projection room.
- (4) Film-handling precautions.
- (5) Laws and regulations governing motion picture projection.
- (6) Projection demonstration in a theatre.

Legal requirements having been met, the projectionist is free to proceed directly to the equipment, and for this work a systematic, step-by-step servicing

plan is helpful. It is only by exercising the utmost care in checking and lining up that the projectionist can be sure that all units have been covered thoroughly, and that the all-important opening show will run smoothly and with professional "snap."

The following suggested plan has been devised with the *very worst* conditions in mind. Specific instructions for checking various projector adjustments were outlined in "Notes on Projector Maintenance" (IP for August, 1948, p. 6), hence only the details of systematic inspection and servicing are treated at length in this article. The principal steps of the plan are numbered and headed to facilitate reference.

### Inspection, Servicing Plan

1. **PRELIMINARY CLEANING.** *Do not switch projector motor on at this time!* Dust off the exterior surfaces of each projector, lamp, magazines, head, motor, and pedestal. Wipe the rust-preventive grease from all exterior and interior parts, and remove rust spots with a small cloth wet with kerosene. Dry thoroughly, apply a thin film of projector oil to the parts cleaned, and again wipe dry. (Do not use cotton mechanic's waste for cleaning projectors.)

2. **CLEANING DRIVES AND GEARS.** Attention will now be directed to the drive side of the machine. Remove excess oil from the mechanism and soundhead, using a medicine dropper to drain off oil pools; afterward clean rags. Scrub off accumulations of grime from the gears with a stiff-bristled toothbrush dipped in kerosene. Be sure to wipe the kerosene off afterward. Check all machine screws and taper-pins. This is the time to requisition gears and other parts which need to be replaced. *Do not oil the projector yet.*

3. **CHECKING THE INTERMITTENT.** Test the intermittent sprocket for end-play and backlash when in the locked position. Note the "feel" of the mechanism when the machine is turned by hand. If there are no evidences of binding, the motor may be run for short periods. With the machine running, listen carefully to the intermittent movement *with the film gate open*. A noisy intermittent unit must be taken out of the head, carefully examined for wear, and adjusted for noiseless, rock-steady operation.

4. **CHECKING THE FILM COURSE.** Remove the upper magazine. Clean thoroughly all parts of the film side of the projection and sound heads, using kerosene as a cleaning agent. Carbon tetrachloride may be used to loosen stubborn dirt deposits. A quantity of clean rags, a toothbrush, and a copper-wire probe are indispensable. The gate door, the aperture plate, and the projection lens should be taken out, and the lens carefully

## Typical State Regulations

Copies of State theatre laws may be obtained free of charge by writing to the proper authorities.

**CONNECTICUT.** *Rules and Regulations Governing Picture Exhibitions.* Address: Department of Connecticut State Police, State Police Headquarters, Hartford, Connecticut.

**MAINE.** *Statutes and Rules and Regulations Relating to Moving Picture Theatres.* Address: State of Maine Insurance Department, State House, Augusta, Maine.

**MASSACHUSETTS.** *Laws, Rules and Regulations Governing the Use of the Cinematograph and Similar Apparatus for the Exhibition of Motion Pictures.* Address: Massachusetts Department of Public Safety, State House, Boston, Massachusetts.

placed in the cabinet for cleaning at a later time.

Check all sprockets for worn or burred teeth. The intermittent and sound sprockets are likely to be the worst, as these are the most difficult to remove. Reverse or, better, *replace* sprockets having worn teeth.

Examine idlers and pad rollers for wear and adjustment. The lateral and clearance adjustments of pad rollers are sufficiently important to warrant a review of maintenance notes thereon.

Thread a short strip of new film over the sprocket. Open and close the pad roller several times rather sharply. Remove the film strip and examine its edges at the place where it was on the sprocket. If an edge is found to be nicked or roughened, loosen the set-screw and move the pad-roller arm in or out, as required, and tighten. Repeat the test until a position is found where the edges of the film are not injured by opening and closing the pad roller.

Thread the sprocket with *two* thicknesses of film and close the pad roller. Adjust the stop-screw until the point is reached where the two thicknesses of film are only very slightly loose on the

sprocket with the pad roller closed. Then tighten the locknut.

Clean the aperture plate and gate door, adjust the tension of the pressure pads, if necessary, and return these parts to the machine. A thin film of heavy petrolatum may be rubbed on the film tracks and pressure pads. (Oil should not be used in the gate, as heat will vaporize it and fog the lens.)

The gates of old-style soundheads and the takeoff drums of newer models may now be cleaned. Petrolatum is unnecessary here. The focus of the optical tube should not be disturbed if this is known to be correct. (More anon concerning this point.)

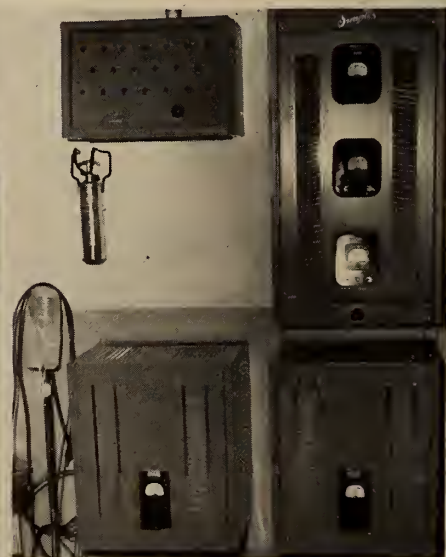
Check the alignment of the intermittent sprocket shoe by slowly closing the gate while the projector is running. If a loud intermittent sound is heard only when the gate is closed, adjustments are necessary.

Examine the lateral guide rollers for condition and cleanliness, but the adjustment of these must wait until the picture projection test is made. Clean and correct the position of sprocket strippers.

Finally, thread up a 10-foot length of film—preferably a strip containing several wide and badly buckled splices—and run down slowly *by hand*, noting the action of the loops and the passage of the film over the sprockets. Correct any faults which may be revealed by this test.

5. **UPPER MAGAZINE.** The upper magazine should be overhauled before replacement on the projector. Take the assembly completely apart, clean and oil the spindle shaft, then reassemble. Clean the fire-valve rollers. Put the magazine back on the machine in correct alignment with the head. Check the assembly by placing an empty 2000-foot reel in the upper magazine and turning it while pressing in on the edge of the reel. Scraping of

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the reel against any part of the magazine indicates a condition to be corrected.

Now test the tension of the friction spring by spinning a fully loaded 2000-foot reel in the magazine. The reel should not run too freely.

6. LOWER MAGAZINE AND TAKEUP ASSEMBLY. It is highly advisable to service thoroughly the lower-magazine takeup assembly of any projector which has been idle for a considerable length of time.

Replace the takeup belt with a new one, if frayed and oil-soaked. Tighten loose belts, as slippage causes irregular takeup action. Replace belts having more than one splice or coupling.

Disassemble the takeup assembly. Inspect all parts for wear. Clean and oil the takeup spindle shaft. Scrub the clutch surfaces with carbon tetrachloride and *do not* oil them. Wash dirt and oil from the leather friction disk with carbon tetrachloride, dry thoroughly, and *oil only one side*.

Reassemble the takeup and adjust the tension to the correct degree. This may be done by placing a fully-loaded 2000-foot reel of film in the lower magazine and switching on the projector motor. The reel should indeed turn (start turning of its own accord), but it should also be easily restrained.

7. COMPLETE LUBRICATION. Oil and grease the motor, drive transmission, projector mechanism, and soundhead according to manufacturers' instructions, using the proper type of lubricant in every case. Drain the intermittent well and refill with fresh oil, if this has not already been done. Run-in the projector for 30 minutes and note the "feel" of the machine afterwards.

8. AUTOMATIC FIRE SHUTTER. The projectionist should assure himself that the lifting and dropping action of the safety shutter is perfect. When checking this device by switching the motor on and off, *do not turn the motor on while the projector is coasting to a standstill*. In other words, wait until the machine is absolutely motionless before turning the motor on again. Failure to observe this precaution may result in injury to the gears.

(The timing of the occulting shutter

## Warning: Correct Width of Adjustable Shutter Blades

Shutters having blades of adjustable width need special attention. It has been stated incorrectly in a well-known textbook on projection that the lens may be about one-third open when the intermittent sprocket starts to move and the same distance open when the sprocket comes to rest, *without affecting the screen image*.

This inconceivably bad practice is advocated as an effective measure for increasing screen illumination.

Actual projection tests prove that the extra illumination amounts to only 2 or 3%—an amount imperceptible to the average eye. The really important effect, however, is the introduction of an annoying *rapid trembling* of the edges of all bright objects in the screen image.

We are forced to conclude, therefore, that the occultation of the film image must be positively of sufficient duration to keep the screen dark during the entire interval of the film movement in the gate. It is decidedly better to have the blades a trifle too wide than too narrow.

will be left until projection tests are conducted. It suffices for the present to see to it that undue backlash and endplay are eliminated from the shutter shaft, and that all the bearings have received proper lubrication.)

9. MOTOR CHECK. The starting action of the projector motor is an extremely important consideration. A faulty cutout or centrifugal switch must be corrected at this time. All electrical connections are examined—the starting rheostat requiring special attention—and, of course, more than a passing glance must be given the motor switch. An unduly loose or otherwise defective switch should be *replaced*, and no attempt made to repair it.

Watch for evidences of strain, excessive current consumption, and excessive heating.

10. FILM-FLOW TEST. This step serves as a final check on the mechanical functioning of the projector. Neither picture nor sound is projected at this time.

Thread up the projector with a reel of film and run it off with magazine, mechanism, and soundhead doors open. Observe the flow of the film and the action of all working parts on the film side of the machine. If minor defects are discovered, they are now corrected. The film-flow test also provides an opportunity to ascertain the pickup time of the loaded projector.

11. PROJECTION LENS. The projection lens is now carefully cleaned and restored to the projector. For the correct methods of cleaning lenses refer to "Coated Lenses: Nature and Care" by A. E. Murray of the Bausch & Lomb Optical Company (IP for February, 1949, p. 7). So comprehensive is Dr. Murray's contribution to this phase of the projection art, that the subject is dismissed here with the oft-repeated admonition:

NEVER "scrub" lenses; NEVER wash lenses in alcohol or other organic solvents! Failure to heed this warning may ruin a fine lens.

12. LAMP AND VENTILATING SYSTEM. The interior of the arc lamp may be so dirty that much time and effort will be required to clean it out. The presence of carbon stubs in the carbon holders is mute evidence of the laxity of the projectionist's predecessor.

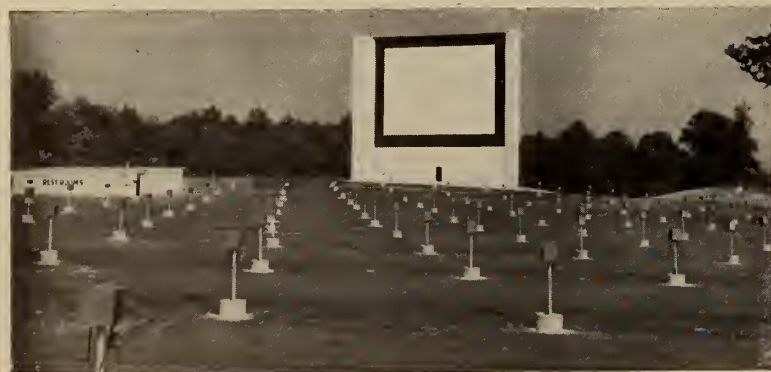
If the vent pipes appear to be clogged with carbon dust and oxide fluff, take them down and clean them before cleaning the lamps. In any event, the effectiveness of the ventilating system should be tested long before an arc is struck. Invisible gases produced by electric arcs are highly poisonous.

As a rule, low-intensity get grimmer than high-intensity lamps. Oil-caked carbon encrustations are frequently the cause of faulty mechanical action. The roof of the lamp should be cleaned first, and all ash removed from the vent. Then the floor may be brushed free of dust. Grease, graphite accumulations, etc., may be washed with kerosene from the guide rods, feeding screws, and reflector gearing. After cleaning, lubricate all moving parts of the lamp according to the manufacturer's instructions.

13. LAMP ELECTRICAL APPLIANCES. Burnish the contact surfaces of the carbon holders. If light filing is necessary, use a magneto file, taking care to preserve the flatness of the surfaces. Then give them a final polishing with crocus cloth. Test the clamping action of the carbon jaws, and give rotating-positive feeds extra attention.

Electrical connections to the carbon holders, arc relay, feed motor, etc., must be secure. It is not uncommon for as much as 3 amperes to be lost through faulty carbon-holder lug connections. The lost current is converted into heat which aggravates the trouble by acceler-

(Continued on page 33)



Typical drive-in theatre layout with modern screen tower. Projection room shown at extreme left-center.

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# The Use of Films in Television

*This report, prepared by the Television Committee of the SMPE, comprising 35 specialists, contributes greatly to a broad understanding of the art. While not related directly to the projection process, this report will serve to lay the groundwork for a comprehensive treatment of projection equipment and technique which IP will publish shortly in line with its policy of providing inclusive coverage of all phases of television.*

**A**T THE present time films for Tv are being photographed with both 35- and 16-mm motion picture cameras at the standard speed of 24 frames per second. For production work where synchronized sound is to be used, the camera must be driven at synchronous speed. A number of Tv stations currently making their own newsreels use commercially available 16-mm professional cameras and associated equipment.

Data supplied by one Tv station indicated that because adjustment of picture size in home receivers varies greatly, all significant action and subject material be kept within a central area having 8½% top and bottom margins and 13% side margins. When this is done, a large majority of commercial receivers will show all-important information.

Closeup scenes give most pleasing reproduction because viewing screens of home receivers are small and the field of action necessarily is limited. Medium shots are generally considered the outside limit, and long shots rarely add anything of value to the film program. Subject matter should be kept as large as the limits and action of the scene being televised will allow without obvious crowding of action or characters.

## **Picture Patterns, Lighting**

Whenever possible, checkerboard patterns with many abrupt changes of contrast should be employed, as these numerous large variations in print density will reduce the horizontal-smear effect that otherwise would be caused by low-frequency defects of present systems. For the same reason, large uniform-colored or relatively dark areas and delicate or minute patterns are to be studiously avoided, particularly in the lower portion or foreground of the scene.

The limited range of picture-tube brightness requires that subject contrast be controlled whenever possible. Usually it is not necessary to resort to flat lighting in order to hold contrast within the brightness range of the Tv system, but even lighting is essential particularly over large picture areas. That is, large picture areas must have about the same

average illumination. Wide variations in brightness over the scene will otherwise have to be compensated for by adjustment of the Tv shading controls.

Adequate foreground lighting is quite essential, since the electric-energy-decay-rate characteristic of the iconoscope mosaic may cause picture degradation in the form of insufficient signal response in the lower portion of the received picture. The general intensity of illumination from scene to scene should be kept relatively constant so that the level of the Tv signal does not change markedly and for this reason night scenes should be avoided.

## **Properties, Titles, Action**

For psychological reasons long fades should not be used because they interrupt program continuity and the audience may think from the long blank period that something is wrong with the receiver.

Clothing and accessories, backgrounds, furniture, and other "properties" should have definite patterns large enough to be clearly visible on the screen of the Tv receiver. Again, fine or delicate detail with minute changes in contrast should be avoided.

To reproduce clearly on small home

receivers, the lettering of titles should be large, boldface on a textured background, and should always be located within the dimensional limits previously mentioned.

Action within scenes should be continuous. This, however, is not always possible, so where inanimate objects are shown for any period of time, motion of the camera by zooming, traveling, change of angle, or slow panning should be substituted to accomplish the desired effect.

In the present state of the art, this type of change sometimes emphasizes the geometrical distortion in the final image. In the transition from one scene to the next, it is desirable to employ lap dissolves, quick fades, or instantaneous "cuts" timed to keep pace with the program.

## **Film Processing Procedure**

Normal exposure and development, as employed in motion picture negative work, should be used for pictures to be televised. Negative gamma is usually carried between 0.65 and 0.70, and the scene density is considered normal if the negative prints in the middle of the printer scale.

Over a period of years numerous closed-circuit tests have been run in an attempt to determine optimum print density for Tv. These tests, although they were not conclusive, have shown that low-contrast prints (gamma between 1.4 and 1.6) with a general density near normal, reproduce well. When the contrast was carried to normal (gamma of 2.20 to 2.50) the print which reproduced best was at least two printer points light.

All of these tests were made from a negative exposed for motion picture theatre use. More recent tests have shown that prints of normal gamma and perhaps 1 to 2 printer points light reproduce best. In view of the great importance of establishing proper film specifications for Tv, this subject needs further investigating and reporting.

Most 16-mm film used by Tv stations is processed by reversal. Current 35-mm practice shows that a negative gamma of 0.70 and a print gamma of 1.50 produce

---

## **Stratovision Tv System 'Iced'**

Westinghouse Electric Corp. will put its Stratovision system of Tv transmission "on dry ice," thus leaving the field to the coaxial cable and microwave relay systems. Stratovision is the much-publicized method of relaying Tv programs via high-flying airplanes. Although Westinghouse predicted an eventual use for Stratovision, competent observers feel that the other two systems will fill all needs.

Although cable transmission for a long while surpassed any other means of Tv transmission, recent increase in the rate of relay station construction is narrowing the former's edge. Most engineers now believe that each of the two dominant methods has its advantages, dependent primarily upon the type of terrain over which the signal is transmitted. Ultimately, it is felt, transmission is likely to be equally divided between the two.

a resulting picture contrast of 1.05, while current 16-mm reversal technique produces a print gamma between 1.00 and 1.20, which has proved satisfactory and is recommended.

A limited amount of 16-mm negative and print work is being done. Current practice is to develop the negative in fine-grain negative developer and print normally.

### Transfer from Film to Tv

The translation of motion pictures into Tv signals is complicated by the fact that motion picture film moves at the standard rate of 24 frames per second while the rate of the Tv signal is 30 frames (60 fields) per second.

A simple factor can be applied to the different frame rates which satisfies the peculiar characteristics of the two systems. Two frames of motion picture film require the same amount of time as five fields ( $2\frac{1}{2}$  frames) in Tv scanning. This relationship is presented graphically in Figs. 1A and 1B, which show that if one film frame is scanned for two Tv fields and the next film frame for three Tv fields, the time difference of frame rate can be satisfied.

This relationship is fundamental as long as the respective frame rates are retained and applies regardless of type of camera or projector.

There are two fundamentally different types of Tv pickup tubes, the storage type (iconoscope—image orthicon) which stores electrical charges produced by a multitude of individual picture elements until discharged by the scanning electron beam; and the non-storage type (image dissector—phototube) where the electrical energy of each picture element is proportional to the incident light experienced at the instant that element is scanned. The phototube is used with the flying-spot scanner and is gaining in popularity with development engineers.

### Iconoscope Tube Technique

The iconoscope camera tube, however, is almost universally used for commercial-film pickup work. Because of its storage feature the iconoscope can be "pulsed" with an intense burst of light of short duration. This produces a charge picture in the tube that is then removed in the normal scanning sequence.

This flash may not be applied during the actual scanning time since it would give a pulsed video signal and a noticeable black "application bar" across the receiver screen. Light is therefore applied during the vertical-blanking period, and its pulse effect is further nullified by proper back lighting of the mosaic screen in the iconoscope tube and electronic gating of the beam current. Since light is applied only during vertical blanking a full scanning interval is avail-

able for pulldown of the next film frame.

Figure 1C indicates the sequence of charging the camera tube with a light pulse, scanning the resulting picture, and film pulldown in 35-mm projectors. Either mechanical or electrical means can provide the pulse.

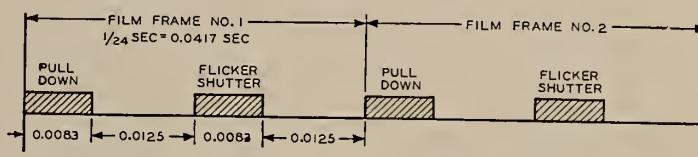
### Precise Control Necessary

A pulldown of approximately 50 degrees and a mechanical shutter having an opening of less than 18 degrees and synchronized at 3600 r.p.m. to open during the Tv vertical-blanking pulse time is practical for 16-mm projectors. Equipment is also available with an electrically timed and controlled gas-discharge tube instead of a mechanical shutter.

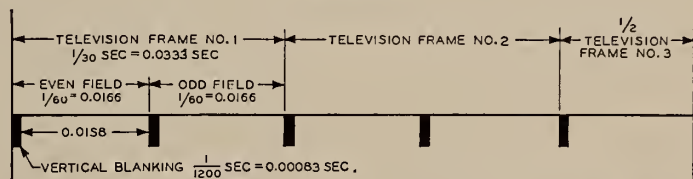
Control of the iconoscope camera requires adjustment of the beam current and continual monitoring of picture "shading." Beam current can be set for average light level, compromising between excessive tube noise at high beam levels and low signal with resulting amplifier noise at high beam levels.

Shading, an undesirable characteristic, is a spurious signal resulting from an uneven distribution of secondary electrons on the tube mosaic and varies with picture content. Adequate correction can be obtained by properly mixing artificially generated signals, saw-tooth and parabolic, and occasionally some sine-wave forms in both the vertical- and hori-

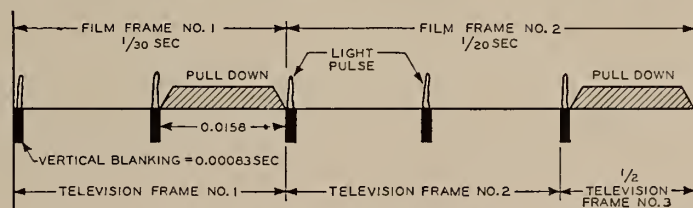
FIGURE 1



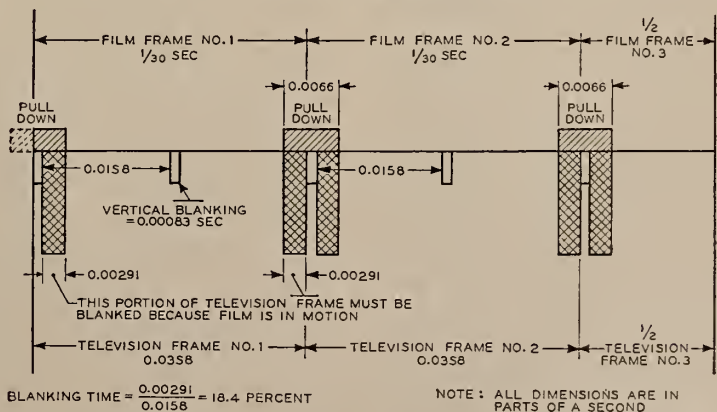
A.—35-mm motion picture projector with 72-degree shutter, 24 frames per second.



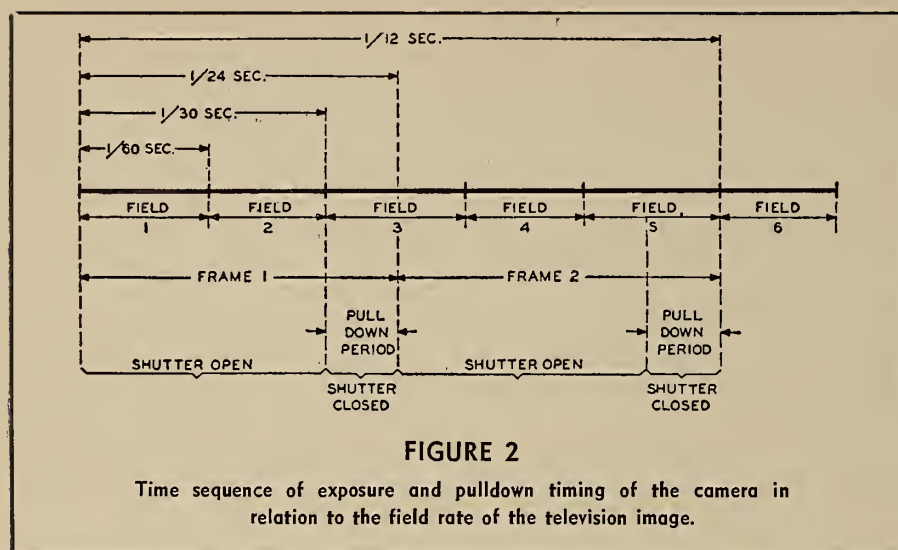
B.—Television picture with interlace scanning, 30 frames per second.



C.—35-mm television intermittent storage system of scanning motion picture film.



D.—Television scanning of motion picture film run at 30 frames per second, 72-degrees pulldown time.



zontal-scanning directions, and applying the results to the camera output.

Another difficulty known as edge flare, which shows up as bright areas usually on the right edge and bottom of the picture, can be improved by the adjustment of an internal edge lighter.

With proper adjustment of the controls and proper high-light illumination of the iconoscope mosaic a very satisfactory picture is obtained. Resolution usually exceeds 350 Tv lines and the signal-to-noise ratio is low but tone gradation is not perfectly linear. The signal-output current is approximately proportional to brightness of mosaic illumination up to about 0.1 foot-candle, but at brighter levels the signal increases less rapidly with increasing brightness. Thus, in combination with the normal viewing tube both the blacks and the whites seem to be compressed.

The coating on the mosaic of the Type 1850-A iconoscope shows a preference for the blue region of the spectrum so that color films can be projected for black-and-white Tv pickup, but tone values of various colors will not agree perfectly with those seen by the eye. Some partial correction is possible by the use of filters on the light source.

### Flying-Spot Scanner Promising

The phototube flying-spot scanner system is now undergoing development and shows considerable promise. It has a number of very desirable advantages over the iconoscope for film pickup, namely, simplicity of components, freedom from shading and other spurious signals, no loss of stored charge during the scanning cycle, excellent contrast range, and high picture resolution.

A major difficulty of the flying-spot scanner, as in any type of non-storage Tv camera tube, as shown by Fig. 1B, is that no film pulldown time is available when the projector is run at 30 frames per second. Some type of nonintermit-

tent projector would seem to be desirable, but the complexity as well as unsatisfactory speed regulation of several proposed types of continuous projectors presents a serious problem.

The iconoscope camera and the flying-spot scanner are both useful with still slides or filmstrips in a standard projector. Camera switching can be accomplished by remote control, and in one case, two film projectors and a slide projector can be switched into a single camera by the use of an accessory optical-mirror device.

Tv lends itself nicely to "fades," "dissolves," and superposition of two pictures by the simple expedient of mixing video signals at the required level before adding the standard synchronizing signal. Necessary controls are commercially available as standard studio equipment. "Wipes" are somewhat more difficult, requiring an electronic switch of a type that is not as yet commercially available.

Sound for Tv from film sources requires no special handling beyond equalization.

### Film from Tv Sources (Cathode-Ray Photography)

Motion pictures photographed from a Tv picture tube are made as transcriptions of live-studio or remote programs for rebroadcasting and may be used at a later time by the station that presented the original program or may be syndicated with several prints from the original made for distribution to subscriber

stations. Picture- and sound-quality requirements are high, demanding utmost attention on the part of station and processing laboratory personnel.

Regular record films are also made but generally at a reduced film-frame rate and have far less rigid quality requirements because they are never rebroadcast.

### Frame-per-Second Conversion

The conversion from the 30-frame-per-second Tv picture rate to the 24-frame-per-second film-picture rate presents a serious problem for Tv recording-camera design engineers. A currently successful solution is based on the use of successive dissimilar scanning cycles.

Another proposed answer is a change of the standard film rate from 24 to 30 frames per second. The logic of this solution appears obvious, but there is a serious handicap of economic inertia to consider since sound films have been made at 24 frames per second and studios and theatres have been following the present standard for over 20 years. There is also the problem of providing pulldown time if photography is on an intermittent basis.

If a film rate of 30 frames per second is ever adopted, it appears that some method of continuous film motion will be desirable, if the necessary constancy of motion can be obtained.

It is possible to design cameras that use either mechanical or electrical blanking during the pulldown period. Continuously moving film cameras are also possible, but the mechanical, optical, and synchronization problems involved are most difficult.

### Modern 16-mm Recording Camera

One 16-mm Tv recording camera now in use is equipped with a mechanical shutter driven by a synchronous motor from the same 60-cycle a-c power source as is used for the Tv synchronizing generator. This shutter has a closed angle of 72 degrees and an open angle of 288 degrees. At the 24-cycle rate this represents a closed time of 1/200 second and an open time of 1/30 second. The latter is equivalent to one full Tv frame cycle.

Figure 2 shows the time sequence of this shutter in relation to the 30-frame (60-field) Tv scanning cycle. The cam-

(Continued on page 31)

### PROJECTION EQUIPMENT EXPORT FIGURES OVER TWO-YEAR PERIOD

Film Projection Equipment	Number—1948—Value	Number—1947—Value
35-mm Projectors	4,154 \$1,637,679	6,936 \$2,532,173
16-mm Silent Projectors	4,830 543,753	8,528 665,764
16-mm Sound Projectors	8,440 2,357,505	10,065 2,961,932
8-mm Projectors	9,278 636,362	14,172 741,242
Arc Lamps	1,887 419,233	3,485 701,859

# Precise Calibration of Lens Markings

IN THE course of an experimental study of errors in the speed markings of photographic lenses, Dr. F. E. Washer of the National Bureau of Standards has devised a convenient graphic method for converting each of these markings for a given lens to the corresponding "effective  $F$ -number"—an  $F$ -number corrected for light losses within the lens.

In this way it is possible to calibrate a lens so that losses of light from absorption, reflection, and scattering within the lens are taken into account, and a more accurate control of the amount of light admitted to the exposed film is obtained.

In recent years, photographic technology has largely developed from an empirical art to an exact science, making it possible to control results in a more scientific manner. With this progress, a demand has arisen for greater precision in the speed marking of lenses. The

transmit the same amount of light as a similarly placed opening of standard size. The standard opening corresponds to an ideal lens of a given aperture ratio, in which incident light is wholly transmitted. A complete calibration is obtained by the use of a series of openings of graduated size corresponding to various aperture ratio values.

More recently, this work has been extended by Dr. Washer in a study of the errors in the marking of 20 lenses having focal lengths between 0.5 and 47.5 inches. It was found that the effective  $F$ -number of the ideal lens can be read-

ily determined for each of the marked stop openings if the light meter readings for a series of standard diaphragms (placed between the meter and a light source) are compared graphically with the meter readings for the range of diaphragm openings of the lens (Fig. 1).

## Establishing the Graph Data

Two curves of about the same slope are obtained by plotting the scale deflections of the light meter against (1) the effective  $F$ -numbers or  $T$ -numbers corresponding to the standard diaphragms and (2) the marked  $F$ -numbers of the lens. The first curve will be a straight line, since the plotted  $F$ -numbers of the

(Continued on page 30)

## Notes Anent the Simplex E-7 Double-Film Attachment

Frequent reference in the literature to the double-film projector attachment used in the studios and elsewhere prompts publication here of these explanatory notes and a graphical exposition, in both halftone and line, of the film path through the mechanism.

The double-film attachment provides for the running of separate picture and sound prints. The film containing the picture starts in the upper magazine, runs through the projector mechanism and a film channel (which forms a part of the double-film attachment) into the lower magazine. The film containing the sound track, on the other hand, starts in the lower magazine, runs through the film channel and sound mechanism and returns into the lower magazine.

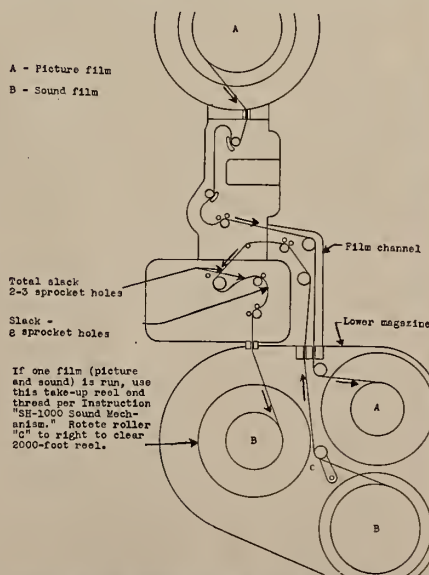
The magazine and film channel assembly consists of a lower magazine for three 1000-foot reels (when two films are used), a takeup reel for the picture film, and a feed and takeup reel for the

sound film. The film channel, which is attached to the motor bracket after certain modifications of the projector are made, provides an enclosure for the picture film between the projector mechanism and the lower magazine, and also for the sound film between the lower magazine and the sound mechanism. A sound sprocket and film guide rollers are included.

Space is provided in the lower magazine so that 2000-foot reels may be utilized when a combined picture and soundfilm is used.

The modification of the projector mechanism and the actual installation of the entire unit require a thoroughgoing knowledge of the equipment and extreme care in procedure. The entire process is described in great detail in a special six-page illustrated folder issued by International Projector Corp. (Bloomfield, N. J.), since the equipment shown and referred to herein is a modified Simplex E-7 projector.

Photo by Metro-Goldwyn-Mayer studio.



Graphical representation in both line and halftone of the Simplex double-film attachment (separate visual and sound films) with special emphasis upon method of threading. This equipment is used extensively in studio work and elsewhere where special processes are employed.

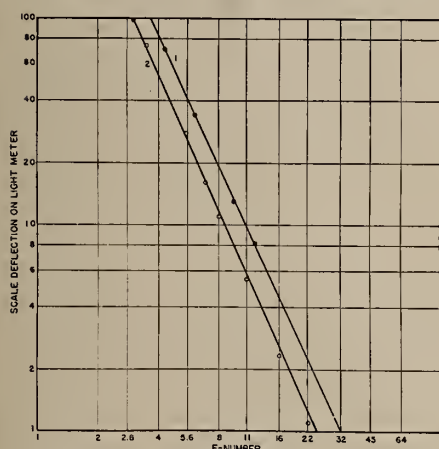


FIGURE 1

method now in general use is based entirely on the ratio of the equivalent focal length of the lens to the diameter of the aperture. This ratio—known as the  $F$ -number—gives no consideration to the great differences in the useful light transmitted by various lenses.

## New Marking Methods Proposed

To correct the situation, several new methods of marking lens diaphragms have been proposed which give weight to the variations in the loss of light for different lenses. Not long ago, Dr. I. C. Gardner of the National Bureau of Standards developed a method of testing the marked diaphragm openings so that values which entirely compensate for differences in transmission can be obtained and applied to the scale of  $F$ -numbers on a photographic lens.

In this system the markings, known as effective  $F$ -numbers or  $T$ -numbers, are obtained by means of a photoelectric cell and a relatively simple photometric procedure, in which the diaphragm of the lens to be calibrated is adjusted to

**P**ORTENDING a drastic shift in emphasis of approach to technological problems by motion picture engineers from the optico-mechanical to the purely electronic, and presaging important changes in operation and economics in the theatre field, were the happenings at the 65th Convention of the Society of Motion Picture Engineers at the Hotel Statler, April 4-8. Registration approached the 700 mark.

If the printed program of the Convention didn't tip-off the metamorphosis of thought and action which the industry's engineering forces are now undergoing, SMPE officers themselves made it crystal-clear by boldly announcing and vigorously supporting a suggested change in name of the organization to Society of Motion Picture and Television Engineers (*italics ours*). That the change will be effected is a foregone conclusion.

The character of the Convention was made immediately apparent when the speakers at the get-together luncheon discussed Tv, more Tv—and nothing else. Followed then two days given over in their entirety to Tv in the form of papers, demonstrations and open forums.

#### **Exhibitor-Engineer Tieup**

One happy circumstance of the proceedings was the announcement of the affiliation with the Society as a sustaining member of the Theatre Owners of America, and this progressive step by the exhibitors was followed up by a joint meeting for the first time in history of the Tv committees of both organizations. Other similar meetings are scheduled for the near future, and there is every indication that exhibitors are at last aroused to the threat to their security posed by the phenomenal growth of Tv.

Dr. Allen B. DuMont, opining that present Tv films were too poor in quality and too costly to make them "preferred" entertainment for theatre Tv programming, predicted that the time will come (he didn't say when) when there will be Tv systems capable of matching the best reproduction standards of 35-mm film. Other DuMont observations:

"Live" programs are today less costly than films for Tv network purposes. Within a year there would be no discernible difference in quality of images as between direct coaxial transmission and Tv-transcription. Present costs of cable transmission and the use of film are almost identical. Some top present Tv programs might be piped into theatres pending the wider distribution of home Tv sets.

Also, color Tv still is 10 or 15 years away, although quite some progress has been made in this field. At present about 50% of the total population of the U. S. live in an area of Tv reception, which

figure will mushroom with the expected opening of from 40 to 50 additional Tv stations this year.

Highlight of the Tv sessions was the demonstration by RCA of its improved

## S M P E Convention Roundup



direct instantaneous-projection theatre Tv system. The system will be available, in pilot-run quantities, probably by the end of this year. The price for a single unit without standby facilities is expected to be \$25,000.

#### **RCA Direct-Projector Tv**

Indicating the solution of such problems as length of throw and proper location in the theatre, this RCA equipment now utilizes a 20-inch mirror and a 15½-inch molded plastic lens having a combined weight of only 50 pounds, as contrasted with the 500-pounds weight of the optical system used little more than six months ago. A smaller optical barrel, only 30 inches in diameter and 36 inches long, is now the only element of equipment required in the theatre auditorium, and for a 15 x 20-foot screen image this barrel may be mounted from 40 to 65 feet from the screen. The maximum throw of earlier equipments was 40 feet.

For the SMPE demonstration, the optical barrel was mounted on a 7-foot-high pipe standard. An optical barrel of this type might, however, be mounted in the front of a theatre balcony, providing the throw would not exceed 65 feet; and it was indicated that methods may be worked out for suspending such a system from the theatre ceiling, if such an arrangement should be found desirable.

In the laboratory model shown, a

small picture amplifier was attached to the side of the optical barrel. The horizontal and vertical deflection amplifiers and synchronization circuits were housed in a cabinet which can be located up to 50 feet away from the optical system. A second cabinet houses the high-voltage supply, and a third is used for the plate power supply and control console.

Both of the latter may be located from 2 to 300 feet away from the optical barrel, if desired, making it possible to control the system entirely from the regular projection room in a theatre.

#### **Possible Tv Program Sources**

Theatre Tv programming appears to fall into two broad classes, in RCA's opinion, as follows:

1. Regular Tv broadcast material.
2. So-called "closed-circuit" performances in which a privately-originated program is fed to one or more theatres.

In the second case, some examples of originating sources might be:

- A. "Live" action in a studio from the stage of a theatre or from some public place such as a sports arena or a site of a political event.
- B. Motion picture film produced either in more or less regular fashion, or by Kinescope photography to "store" some program such as those described.

In any case, program transmission might be by microwave relay, equalized telephone lines, coaxial cable, or some combination of these.

The pictures shown by RCA included regular program material picked up from Tv station WNBT, part by radio transmission and part by equalized telephone line; live action picked up by an image-orthicon camera located in an adjoining room; and motion pictures scanned by equipment also located in the anteroom. Image quality was far removed from that of good 35-mm theatre projection, as might be expected at this stage of development of Tv, although there was a noticeable improvement in the quantity of projected light.

#### **Tv as a Box-Office Aid?**

Other observations anent Tv: Ralph Austrian, formerly with RCA and RKO and now a Tv consultant, said that theatre Tv is destined to become the most potent force in halting any drop in film

#### **Eddie Auger Stricken at SMPE Meet**

A tragic note was sounded at the SMPE Convention when Edward Auger, 67, who retired several years ago as a national RCA representative in the theatre field, died suddenly in the lobby of the Hotel Statler. Known to thousands of exhibitors and projectionists, Auger was attending the Convention in a private capacity.

grosses. Large screen Tv, he said, will soon become the greatest tool of all to get people out of their homes into theatres. The fact that the exhibitor has a box-office makes him the sole person with an answer to the question of who is going to pay for Tv, said Austrian, adding that the motion picture industry cannot preserve its prosperity by doing nothing to counteract the advance of Tv.

Phonevision, a Tv system intended to be tied in with phone lines and require payment for program reception in the home, was pictured by a Zenith Radio representative as freeing Tv from commercialism and providing *Hollywood* with a steady income. Strictly a home-Tv proposition. Phonevision is not seriously regarded as practicable by film people.

The third Convention day was given over to a symposium on high-speed photography, of little interest to readers of IP, except for mention that one of the subjects discussed was the taking of motion pictures at speeds up to 500,000 exposures per second, while in the still picture field there exists a method for taking pictures at an exposure time of about 1/20-millionth of a second!

Philips Lamp Works, of Eindhoven,

Holland, presented a paper on a mercury-vapor lamp which operates on d-c and lights an area 5 inches in diameter to a value of 50,000 foot-candles.

### 16-mm Group Goes to Town

The 16-mm proponents took over the proceedings on the fourth day, and they proceeded to sponsor a session which by means of papers, an open forum in which no punches were pulled, and the exhibition of 16-mm films which visually and aurally were eye-openers and served notice on the 35-mm contingent that the smaller-gauge film was now ready to make a real fight for preeminent position in the industry.

It was generally conceded that the days when 16-mm sound recording and reproduction was bound by the limitation of a 4000-cycle top cutoff were definitely past. During this session were presented some examples of magnetic tape recording and reproduction which made one wonder if this medium would not some day not too distant in the future give sound-film a terrific fight for its life.

The closing day saw the presentation of a paper by E. K. Kaprelian, of the U. S. Signal Corps, which covered the theory of design of large-aperture objective lenses of  $F:1$  or greater. The author

summarized the application, testing and performance of these extreme aperture objectives.

F. J. Kolb, of Eastman Kodak Co., pointed out that experiments had shown that air-cooling of motion picture film would minimize the in-and-out-of-focus effect which occurs as the film passes through the heat at the aperture. He said that 30 to 60% additional screen illumination can be obtained if film is air-cooled and its position controlled by high-velocity air jets at the aperture.

### Electronic Arc; L-S Cell

A new method of controlling the feeding of carbon arcs was described by J. K. Elderkin of the Forest Manufacturing Corp. In this method (already described in IP) each feeding mechanism is individually driven, and the number of feeding impulses may be varied from 20 to 120 per minute. R. W. Lee, of General Precision Labs, offered a paper on "Lead-Sulphide Photocell Characteristics for Use With Film Sound Tracks." This cell (also discussed in past issues of IP) is generally regarded as having many advantages over the conventional caesium cells now in use.

Abstracts of many of the papers presented at the Convention are appended hereto:

### AIR COOLING MOTION PICTURE FILM FOR HIGHER SCREEN ILLUMINATION

F. J. Kolb

Eastman Kodak Company

One of the limiting factors in obtaining the maximum obtainable screen illumination in motion picture projection is the film itself, which does not perform satisfactorily beyond a certain maximum intensity of radiation. Such limitations are particularly serious when an unusually large screen is needed, as in a drive-in theatre.

Studies made of film behavior under high projection intensities have shown that heating of the film is apt to swell it out of focus. One method of overcoming this problem is increasing the cooling of the film.

A method has been devised of measuring radiant energy incident on the film and studies have been made of the absorption of radiation, both visible and infra-red, on films of varying silver densities. When film is projected at high intensities two phenomena occur which make it impossible to obtain a satisfactory screen image: in-and-out of focus and blistering. Other phenomena, such as negative drift, embossing, change in reflected image tone, focus drift and image flutter, are not nearly so serious.

Experiments in air-cooling have been made in which air jets are directed at the film in the aperture. In addition to cooling, these jets are used to minimize mechanical displacement of film by contributing to the proper positioning of the film. The equipment used in these experiments is described

(Continued on page 27)

## Letter to the Editor—on the Square

I sincerely hope that abstracts of the more interesting of the forthcoming SMPE papers will appear in IP. It does seem, though, that there are plenty of really practical problems requiring attention, and that excursions into the abstruse technological fringes of the projection field are out of place until the more pressing practical problems are taken care of. I suppose everything from tape recording to the relativity-shift of light rays will be discussed—everything, that is, except how to put on better shows!

Well, if most projectionists think that the matter of rounded screen corners is unimportant, there is little or nothing I can say that will convert them to my point of view. I really am a fanatic on the subject, and I suppose that I am the only member of the True Church of Screen Masking.

Come to think of it, I can quote something from the "Bible" to you—the "Bible" being IP. On pp. 27 of the March issue there is a little item titled "Slant Lines Held Less Visible". That is just the clue I have been waiting for! Now I can begin to understand why the rounded corners are less conspicuously visible (psychologically) than the sharp, square ones. The angle which the middle of the curve makes is  $45^\circ$  to the horizontal and vertical boundaries of the screen image!

More power to those Kodak scientists: they are doing my work for me. I don't care a whit that most exhibitors use square screen corners at the present time: they have clearly fallen into damnable error. Perhaps some day they will see the light—and not on the square.

Frankly, though, I am 100% serious about this matter of screen corners. Rounded corners really help to relax the audience and keep them absorbed in the picture. Non-dramatic films don't need rounded corners; but with the exception of newsreels, travelogues, and documentaries, all the films made for theatre exhibition depend upon tangible emotional qualities. Most of it is hokum, but that's the way it should be. Corn means shekels at the box-office.

I am one of those old-fashioned souls who believe that highbrow, intellectual films having "significance" can kill the picture industry quicker than can television. People go to the movies to laugh and cry and be thrilled—not to think!—ROBERT A. MITCHELL.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**A** DELEGATION from Hollywood, including IA President Walsh and Roy Brewer, IA representative on the West Coast, was received by President Truman several weeks ago and discussed with him the present deplorable conditions in the studios. The President was shocked by Walsh's report that about 40% of the studio's technical employees were jobless, and since Great Britain's restrictions on American-made movies were hurting the industry, he promised to take the matter up with the British foreign secretary, Ernest Bevin, who was in Washington at the time.

- Fred Parker, secretary and business representative for Local 433, Rock Island, Ill., reports the signing of new 2-year contracts with the Tri-States Theatres and the Singer Davenport Corp., providing for increases of 7½% for the first year and an additional 5% the second year, plus vacations with pay. The projectionists working in the two drive-in theatres in the Local's jurisdiction receive \$115 per week on a 39-hour work week. Negotiations now in progress with the independent theatres are expected to be concluded very shortly. Assisting Parker in the negotiations are Mark M. Maston and Edward Short.

- In commemoration of his deep interest in civic affairs, the city of Utica, N. Y. has named a new housing project in honor of the late Glenn H. Humphrey, former business agent of Utica Local 337 and for many years secretary of the 10th District.

- The first of a series of educational meetings on the technical aspects of theatre television was held several weeks ago at the Loew-Poli College Theatre in New Haven, Conn., under the sponsorship of the Connecticut State Association and the five IA Locals in New Haven—Nos. 74, 273, 795, B B-41, and F F-41. About 400 persons, including district and theatre managers, stagehands, projectionists, and other theatre employees attended the meeting, which is the forerunner of a series of such meetings to be held in many other key cities.

C. Y. Kean, engineer at the RCA Laboratory, Camden, N. J., discussed the

technical aspects of theatre television. Following the showing of National Carbon Company's Technicolor film, "Carbon Arc Projection," technical questions pertaining to the subject were answered by the company's representatives—A. B. West, Paul Reis, and Neil Croarkin.

Other speakers included Prof. E. W. Bakke, director of the Yale Labor and Management Center; Joseph M. Rourke, secretary-treasurer, Connecticut Federation of Labor; and William Scanlan, IA representative.

Anthony N. Basilicato was chairman of the General Educational Committee for Local 273. Other members of the Local serving on the board were Alfred Frazier, president; Louis LaVorgna, Jr., vice-president; Ernest De Gross, secretary; Edwin Boppert, treasurer; and Matthew Kennedy, business representative.

- Clarence Jalas, secretary of Chicago Local 110, was appointed by Mayor Kennelly of Chicago to the board of examiners for motion picture projectionists.

- A gala affair was the Silver Anniversary celebration last month by Local 631, Orlando, Fla. The festivities began at 3 o'clock in the afternoon with open house at the Angebilt Hotel and continued until 10 o'clock at night, followed by an elaborate midnight banquet at Chef Manuels.

IA President Walsh and International Secretary-Treasurer Raoul, the honored guests, were the speechmakers of the evening. Among the out-of-town guests were A. S. Johnstone, New Orleans Local

293 and IA representative for the 7th District; Jake Pries, business representative, Local 225, Atlanta, Ga.; Earl Walker, Local 236, Birmingham, Ala.; John N. Spearing, business representative, Local 511, Jacksonville; A. H. Greeley, business representative, Local 552, St. Petersburg; Arthur Bowden, secretary, Local 643, Lakeland; M. E. Forsyth, business representative, Local 558, Daytona Beach; C. W. Crow, business representative, and J. W. Cummings, secretary, West Palm Beach; George Raywood, business representative, Local 316, Miami; W. E. Sullivan, business representative, Local 321, Tampa, and many others.

- We regret to report the passing of Roy Y. Carlson, 54, member of Denver Local 230. He was a member of the Local since 1915, and for the past 17 years had been employed as projectionist by the Fox Inter-Mountain Theatre Corp. Carlson was one of the founders and a charter member of the Francis Brown Lowry Post No. 501, Veterans of Foreign Wars, and a member for the past 25 years of the Masonic Highlands Lodge No. 81, Colorado Consistory No. 2, and El Jebel Shrine. He is survived by his widow, mother and a sister.

- The poor projectionist attendance at the technical sessions of the SMPE convention held this month in New York should serve notice, we think, to the powers that be that the Society's brushing aside from its agenda of practical projection problems in favor of the more advanced technological aspects of kindred arts is finally bearing fruit. We have never seen so few projectionists at any SMPE gathering, and we believe that the Society's bid for projectionist support should be backed up with a more active interest in the practical aspects of projection problems. At the recent meetings, the closing half-day session listed the only strictly projection paper on the program.

- About 18 months ago, nine members of the ILGWU's Winona, Minnesota, Local were discharged by their employers for "union activities." The officials of the Local refused to accept these

## Loew's Earnings Refute Yelps Anent Film Industry 'Death'

Loew's, Inc., which through its ownership of Metro-Goldwyn-Mayer is active in all three branches of the motion picture industry—production, distribution, and exhibition—had a net profit of \$4,117,117 for the 28 weeks ending on March 17 last. This figure is after all charges, including taxes, and also a reserve of \$1 million for "contingencies" and a depreciation write-off of \$2½ millions. Net profit in same period last year was \$3,886,745.

dismissals and fought to have the employees returned to their former jobs. The Local's determination to protect the welfare of its members resulted in the re-instatement of the discharged workers *with back pay*. The members of this Local are fortunate in the knowledge that their interests are safeguarded by capable and fearless officials.

- Here are further details on the new contracts agreed to between Los Angeles Local 150 and the theatre supply houses. As we mentioned last month, Local 150 members employed by the supply houses were given a 20c-per-hour increase, retroactive to December 31, 1948. Projection sales engineers now receive \$133 per week, and the cinetechnicians get \$106.40. These salaries are based on a 40-hour week, Monday to Friday, with time and one-half for overtime and for Saturdays and Sundays, and double time for holidays. Emergency calls on Saturdays, Sundays and holidays are 4 hours minimum. The men are allowed 7c per mile for the use of their cars while on the job. Projectionists running special shows receive \$16, with a 4-hour minimum call; each additional hour at \$4. Magnus Nielsen, the newly-elected business representative for Local 150, was in charge of negotiations.

- Charlie Muller, chief projectionist for Radio City Music Hall, is a mighty proud dad these days. His daughter, Hazel Barr, successfully defended her title in the Metropolitan Senior Women's Low-Board Diving championship. She retained her crown with a score of 96.3 against 87.8, the next highest score.

- Visiting the offices of IP during the past few weeks were Clarence Jalas, secretary, Chicago Local 110; Jack Behlke, Chicago Local 110, field representative for Motiograph; Frank Rob-

bins, secretary, Irish Transport Workers Union, Dublin, Ireland; H. Paul Shay, Local 289, Elmira, N. Y., and secretary for the 10th District; Louis Williamson, business representative, Local 186, Springfield, Mass.; Herbert Aller, secretary-business representative, Camera-men's Local 659, Hollywood, Calif.; Arthur Miller, Local 659 and three-time Academy Award winner; and Allen Gordon Smith, NTS New York City branch manager (what, again?).

- Taking his cue from Grandma Moses, who began a successful painting career when she was well past 70, George H. Weil, member of Local 233, Buffalo, N. Y., has embarked upon a new hobby—landscape painting. Weil has been a projectionist for the past 37 years, taking up painting only four years ago. He began his career as an artist without any formal instruction, merely relying upon a few tips from a neighbor of his who is a portrait painter. "You're never too old to start doing something you really enjoy," said Weil. "As a youngster in school, I loved to work with crayons and pencil. Finally, I decided I'd like to be an artist and I bought an easel, some brushes and paint and went to it."

Although Weil paints just for the love of it, he has sold several canvases. Last year two of his paintings were shown at an industrial exhibit in New York.

- Pete Benard, Local 277, Bridgeport, Conn., was elected president emeritus of the Bridgeport Central Labor Union. Pete has been interested in the labor movement for over half a century, and helped to organize Local 277 about 35 years ago.

- Due to the efforts of Bert Ryde, business representative for Buffalo Local 233, Jack Sawyer, member of the Local, still is at his old stand as chief projectionist

for the Loew circuit in Buffalo. Due to the split in theatre interests, Jack's status was a bit uncertain, but a huddle between Ryde and Lester Isaac, Loew's projection supervisor, ironed things out in fine shape.

- Our very good friend, Sam Bonansinga, business representative of Local 138, Springfield, Ill., was recently appointed 8th vice-president of the Illinois Federation of Labor. A labor leader for more than 30 years, Sam has held the post of president of the Springfield Federation of Labor since 1940, being re-elected each year without opposition. He has been business representative



Sam Bonansinga

for Local 138 since 1918, and for the past 22 years has been stage manager of the Orpheum Theatre in Springfield. He is extremely popular in labor circles and is held in high esteem by his associates. To sum it all up, Sam Bonansinga represents the type of labor leader we proudly call our own.

- We were glad to hear that Harry Barco, business representative for St. Louis Local 143, has completely recovered from a gall-bladder operation and is back on the job.

- One of our overseas subscribers, Frank Robbins, from Dublin, Ireland, paid us a surprise visit last month. He is secretary of the Theatre and Cinema branch of the Irish Transport and General Workers Union, and is spending several months in this country to get first-hand information on the many phases of American know-how in technical and organizational

#### MEMBERS AND GUESTS AT RECENT LOCAL 631, ORLANDO, FLA., TWENTY-FIFTH ANNIVERSARY CELEBRATION



Grogan Photo Co., Orlando, Fla.

Standing (left to right): A. H. Greely, L. 552, St. Petersburg; Arthur Bowden, L. 643, Lakeland; Brack Beasley, Pat Grier, L. 631, Orlando; Fred Raoul, L. 225, Atlanta (Ga.); Ed Forsyth, L. 558, Daytona Beach; Arthur Pope, F. B. Eades, John Lovejoy, Walter Creamer, L. 631, Orlando; C. W. Crow, L. 623, West Palm Beach; Geo. Raywood, L. 316; Miami; Paul Buress, L. 666, Chicago (Ill.); J. W. Cummings, L. 623, West Palm Beach; Angelo Sands, L. 545, Miami; R. M. Sligh, L. 115, Jacksonville; Leon Cazin, W. E. Sullivan, L. 321, Tampa; John Bender, L. 552, St. Petersburg; Geo. Dougherty, R. B. Ambrose, L. 631, Orlando; Spencer Locke, president, Central Labor Council; Shields Bennett, L. 643, Lakeland; Earl Walker L. 236, Birmingham (Ala.); B. L. Bradford, L. 643, Lakeland; Dan Altomond, L. 631, Orlando.

Seated (left to right): Chas. Toy, L. 115, Jacksonville; A. M. Johnstone, L. 293, New Orleans (La.); IA President Richard Walsh; J. B. McGee, L. 631, Orlando; General Sec.-Treas. W. P. Raoul; J. N. Spearing, L. 511, Jacksonville; Richard Gabel, L. 631, Orlando; Jake Pries, L. 225, Atlanta (Ga.); R. Noble, L. 552, St. Petersburg; Joe Sanders, Jim Scobie, L. 412, Sarasota; J. M. Vost, L. 558, Daytona Beach; A. H. Montgomery, L. 462, Vineland (N. J.); L. R. Moss and W. Hoffman, L. 631, Orlando.

matters. The IT&GWU differs from our own IA in that it admits to membership everybody working in a theatre—projectionists, stagehands, chorus girls, charwomen, porters, cashiers, etc.

Robbins was very much impressed with his visits to Radio City Music Hall and to the RCA Exhibition Hall. Charlie Muller, chief projectionist at the Music Hall, took Frank on a personally-conducted tour through this world-renowned establishment; and at the Exhibition Hall both Charlie Kellner and Mike Springer made his visit a most pleasant and informative one.

- Frank Morrison, secretary of the AF of L for 43 years until his retirement in 1940, died last month at the age of 89. A prominent figure in the labor movement, he saw the AF of L grow from a membership of 250,000 to its present strength of nearly 8,000,000 members. He devoted his life to the cause of labor and proved a very good friend to the International Alliance in its early struggles.

- The 10th Anniversary celebration for Local 723, Norwood, Mass., was held last month at the Fox and Hounds Club, Boston. It was a gala evening, topped with plenty of refreshments and entertainment. Among the invited guests were IA Representative Wm. C. Scanlan; Joseph Nuzzolo, president, and Walter F. Diehl, business representative, Boston Local 182, and Delmont Merrill, business representative, Waltham Local 505.

- We regret to report the passing of another old-timer. Roy Grove, old-line member of Pittsburgh Local 171 and projectionist at the Stanley Theatre for more than 20 years, died after a lingering illness. During our many years of traveling around the country, we never

## Unique Method of Alternate-Frame, 16-mm Projection

By H. HILL

*British Observer for IP*

SINCE the inception of 16-mm sound motion pictures the sound reproduction of such films has always been at a great disadvantage to its bigger brother, the 35-mm soundfilm. The great difference in relative film speeds is that with 16-mm film reduction printing must be employed, with its consequent losses and inefficiencies, and that very fine slits must be used to obtain reproduction in the upper frequencies.

This situation has been altered radically by the introduction of an ingenious projector which combines some of the advantages of both 35- and 16-mm soundfilm. The high quality of visual and sound reproduction afforded by this unit promises a bright future for the equipment and the system it employs.

Developed in London after 40 years of experimentation by Martin Harper, this unorthodox device is certainly a most significant technological development.

### Alternate-Frame Projection Used

Realizing the tremendous scope of 16-mm film usage, Harper hit upon the idea of doubling the speed of the film and, as a necessary concomitant, projecting alternate frames. This, of course, brought the linear film speed into conformity with 35-mm soundfilm and permitted the soundtrack to be contact-printed direct from 35- to 16-mm film. The device was patented in England in 1938.

This process requires special film and passed through Pittsburgh without stopping off at the Grove home. We lost a very good and sincere friend when Roy Grove passed on.

a suitable non-standard projector with which to use it. The accompanying sketch shows how this film is constructed.

Instead of the usual perforations down the side of the film, they are placed between the alternate frames, arranged in alternate ones and twos. The frames



Construction of the Harper film strip. Perforations are placed between alternate frames, which are projected alternately. Sound tracks are at each side of the film.

are projected alternately; and when the film has been run through the projector once it is simply re-threaded and run back in reverse, utilizing the inverted frames which were unused on the preceding run.

### System's Advantages, Limitation

The respective soundtracks are at each side of the film, and since the track is contact-printed direct from 35-mm film, it means that the running speed must be 90 feet per minute.

The advantages of this novel method of 16-mm projection are: (1) high-quality sound; (2) no rewinding of film in certain cases; (3) perfectly steady picture, and (4) Maltese-cross movement. Its limitation is that it requires special film which cannot be projected on standard projectors.

Recently a projector has been developed which will project both standard and the Harper films. This equipment is a precision machine through the use of which film damage is almost completely eliminated. Although these units are not yet available generally, a vast extension of its use is looked for within the not too distant future.

### MEMBERS OF KANSAS CITY LOCAL 170-A MEET WITH ST. LOUIS LOCAL 143-A MEN



Television in the theatre was the chief topic of conversation at the meeting held recently between Local 170-A and Local 143-A men. Pictured above, taking part in the discussions, were (front row): L. H. Parker, secretary, Local 143-A; Jack C. Pickett (standing), board member, Local 170-A; H. Cuffie, business representative, Local 143-A; Norval G. Parker, president, Local 170-A. (Back row): Wm. S. Thompson, vice-president, Local 170-A; Mel T. Tivis, treasurer, Local 170-A; M. William Walker, secretary, Local 170-A; George L. Smith, president, Local 143-A; Orville Copeland and John H. Adams, Jr., members of Local 170-A.

### PERSONAL NOTES

STEPHEN WIEDMANN has been appointed vice-president in charge of Alpine Western Electric Co., announces the Westrex Corp. During the past year he supervised Westrex activities in Norway, Sweden and Finland.

H. TSCHERNING PETERSEN, manager of Western Electric of Denmark, will temporarily assume managership of Stockholm, Sweden, office, dividing his time between both cities.

JOSEPH G. CSIDA, for more than 15 years associated with *The Billboard*, has joined the RCA Victor Division of RCA as assistant director of public relations.

# Lens Design and Manufacture

**C**AMERA and projection lenses are made of optical elements, concave or convex in form according to the design which has been arrived at mathematically by the lens computer, and in various types of optical glass. These different optical glasses possess characteristic physical properties but are quite indistinguishable one from another to the unaided eye.

The properties in which the optical designer is particularly interested are refractive index and dispersive power. It is necessary to have available a great variety of types of optical glass to enable the designer to reduce to a minimum the aberrations peculiar to the particular lens system he is designing.

The properties required to be known by the lens designer are characteristic not only of the type of glass but of each melt of glass, and are dependent upon the chemical composition of the glass. Optical glass consists mainly of silica—that is, sand—together with sodium and potassium carbonates and other metallic salts which impart particular properties.

## Good Optical Glass Requisites

The art of making good optical glass lies in the melting together of the chemicals to produce a glass which is free from color and inclusions, uniform in chemical and physical characteristics, while possessing a high degree of stability.

When reasonable quantities of lenses are to be made, it is usual to commence with mouldings approximating the shape of the finished elements. When small-quantity production has to be carried out, the blanks are cut roughly to shape from slab glass, using a diamond-loaded saw. It will be appreciated that it is less economical to cut from slab glass than to start from a moulded shape.

Each melting of a particular type of glass has its own physical characteristics, and the optical designer must know them to great accuracy. There are various

*Supplementing the wealth of data on optics which has appeared in IP recently is this paper, delivered before the British Kinematographic Society, which constitutes a worthy addition to the literature of the art.*

By A. HOWARD ANSTIS

instruments available for measuring the refractive index and dispersive power. Samples of each melting are tested as received from the glass manufacturer, and the constants are recorded for use in subsequent lens calculations.

The lens data, specifying the melts of glass to be used, the diameters, radii of curvature, and thicknesses of the various elements, are passed to the works from the design department.

For small-quantity production the surfaces of the blanks are roughed to curvature by hand. The operator rubs the blank against the surface of a rotating spherical tool made of brass or cast iron, while feeding on coarse carborundum and water as abrasive. For larger quantity production the blanks are spherically milled with diamond-loaded milling tools.

## Lens Grinding Process

Lens elements have a spherical surface on both sides, and each surface has to be processed separately. One side is rough-ground, smooth-ground, then polished. This is then repeated on the other side, bringing the center thickness of the element to its computed value, and the element is then edge-ground to the diameter specified.

The abrasive used for rough grinding is quite coarse. For smooth grinding a range of fine abrasives is used, until a very smooth surface is finally obtained. The action of polishing is to smooth out the fine pits left by the grinding, the surface of the glass actually flowing.

It is convenient to perform this smooth grinding and polishing with the lens blanks stuck with pitch on so-called runners, so that many can be processed at one time: they then form what is called a block of lenses. The number of lenses that can be accommodated on a block will depend on the diameter and the radius of curvature.

The blanks are sometimes roughed singly and stuck into a block, or sometimes the blanks are roughed as a block by being cemented into recesses in a machined runner. The roughed block of lenses is then screwed onto the spindle of a smoothing machine for smooth grinding. The size of the machine used will depend on the radius of curvature of the block, but the principle is always the same.

The block is rotated on a vertical spindle and the grinding tool moved in an oscillatory motion over the surface of the lenses. Emery and water is used as abrasive, and the lapping is continued with successively finer grades of abrasive until the surface is of a sufficiently fine greyiness for polishing.

The same type of machine is used for polishing (the polishing tool being similar to the grinding tool) by having a layer of about 1/6 inch of pitch on the surface. The polishing tool moves over the ground surface of the lenses, lubricated by rouge or other metallic oxides and water.

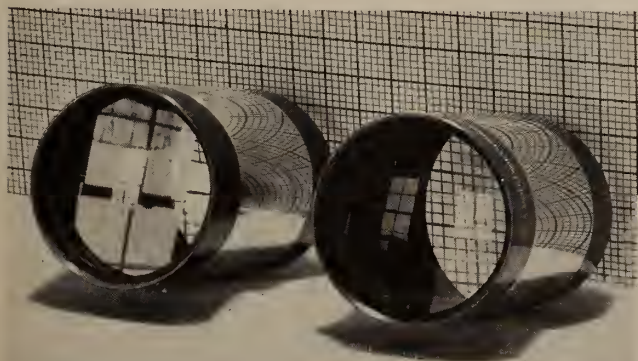
## Checking Radius, Sphericity

Quite a high degree of polish is obtained after 30 minutes, and it is then that the operator commences to take an interest in the figure of the surface. By "figure" is meant the shape of the surface being produced. The lens surface must be perfectly spherical and must also comply accurately with the designed radius of curvature. The surface is tested by means of a glass plate which is of opposite curvature to the surface being produced.

Interference fringes, known as "Newton's rings," are obtained between the surface and the test plate: by means of these fringes the departure from radius of curvature and sphericity of the surface under test can be ascertained to great accuracy. After several hours polishing, the block will be fully polished and also acceptable for curvature.

The making of the test plates is a very skilful task, involving much checking by interference fringes and for radius of curvature.

The highest quality grinding and polishing still is performed by hand by



•  
Comparison of uncoated (left) and coated projection lenses, showing marked reduction in reflections and freedom from glare in the coated lens.  
•

skilled craftsmen. With large lenses and prisms, it is very difficult to produce the glass perfectly homogeneous. If inhomogeneity of the glass is indicated, then one surface of the lens or prism is rubbed by a small polisher to deform the surface so as to neutralize the effect: only a few wave-lengths of glass would be so removed.

The removal of the lenses from the pitch is facilitated by putting the blocks of lenses into a refrigerator. The pitch contracts at a different rate to the lenses and the lenses can easily be removed quite clean.

### Edge-Grinding and Assembly

Lenses, after being polished on both surfaces, have to be edge-ground so that the optical axis is true with the edge. To do this the lens is stuck with wax onto a chuck. The lens is warmed and moved on the chuck until reflected images seen in the lens surfaces are perfectly steady. The spindle, together with the lens, is then transferred to a mechanical edge-grinding machine and the lens is edged to the correct diameter.

For work of the highest accuracy, the lenses are edge-ground by hand, the operator checking the concentricity of the lens continually. Chamfers are produced at the same time as edging.

Lenses which have to be cemented are now stuck together with Canada balsam, and set up concentric on a chuck as if setting up for edging. The lenses are then ready for mounting and are bevelled into their cells. The cells are assembled into the lens bodies, and the completed lenses are ready for test.

### Anti-Reflection Coating of Lenses

When visible light passes through an optical system, about 2% is absorbed per centimeter of glass. At each air-glass or glass-air transmitting surface between 4 and 8% is lost by reflection, dependent on the refractive index of the glass. The reflected light which is lost suffers multiple reflection between the lens surfaces and finally makes its presence felt as a general background of illumination in the image, whether photographic or projected, causing a reduction in contrast. In bad cases, flare spots are present also.

By means of surface coating, very nearly all the reflected light is eliminated, passing instead through the system to increase the brightness of the image. The prime advantages of surface coating are, therefore, increased transmission and improved contrast. The film is only a few millionths of an inch in thickness, being produced in high-vacuum plants.

The surface treatment of lenses has opened the way to more complicated lens systems, since the necessity of keeping the number of elements to a minimum has been largely removed. The large-aperture projection lenses now employed

resemble photographic anastigmat lenses more and more in their construction. The separation of the various elements is critical, and if dismantled, the lens has to be very carefully re-assembled. Such lenses should therefore be sealed.

### Transmission Calibration Scale

To quote an example of the increase in transmission caused by blooming: one class of  $F:3.5$  lenses has a transmission of 70% prior to blooming and 91% after blooming.

The transmission difference between various makes of lens, bloomed and unbloomed, when set to the same aperture value, has become serious in the case of taking lenses for color films, and it has been proposed to mark photographic lenses with a transmission scale. The scale will take into consideration the light-transmitting power of the lens, so that all lenses of whatever make, bloomed or unbloomed, would transmit exactly the same amount of light when set to the same  $T$ -number.\*

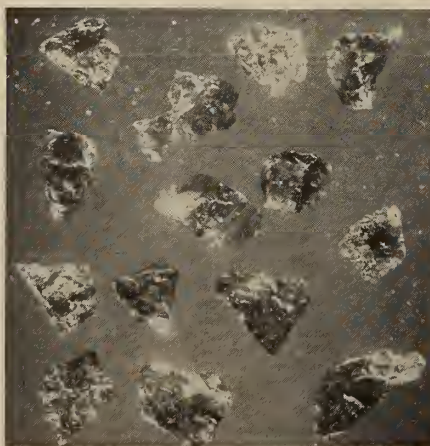
There are mechanical and optical tests to be applied to the finished lenses, and from an optical point of view the focal length and resolution are the important criteria.

### Formulating Resolution Data

Photographic lenses were formerly tested by photographing a test chart to ascertain that the resolution was satisfactory over the area to be covered by the lens. The testing of long focus lenses in this way is costly, as the plates are very big; also much storage room is required to keep the records of lenses which have been manufactured. A method of test was devised, therefore, which enables the equivalent focal length of the lens to be ascertained, and at the same time test visual and photographic resolution.

The instrument used is called a "nodal slide". The lens under test is arranged

\* See "T-Number vs. F-Number Lens Markings," IP for March, 1949, p. 17.



Coarse emery particles at 12x magnification. These sharp particles are used in grinding lenses.

by trial so that a pivoting point on the lower carriage passes through the back nodal point. In front of the lens is a collimator with a resolution graticule. The image of this resolution graticule, called a Cobb-type test object, is focused by the microscope and the visual resolution as the lens is swung through any angle can be examined.

The photographic resolution on any type of emulsion can be determined by removing the microscope and putting a  $2\frac{1}{2} \times 3\frac{1}{2}$ -inch plate into the repeating back of the instrument. A series of resolution photographs is made with the lens rotated through various angles, then further sets of photographs are made in and out of the visual focus position.

In this way, the resolution data for any focal length lens can be obtained on a very small plate. The equivalent focal length of the lens is shown on a scale and is the distance between the pivoting point and the focal plane.

Projection lenses are tested usually for resolution and focal length on a small nodal slide, and then finally in an ordinary projector, using a piece of transparent quartz bearing a multitude of fine detail as the test object.

A foco-collimator is used for the precise determination of the equivalent focal length of short focus lenses. Special test benches are used for testing enlarging and process lenses, also for testing such lenses as wide-angle survey and gauge projection lenses, for which freedom from image distortion is the important criterion.

The standardization of a transmission scale is one of a number of optical matters at present receiving consideration by the British Standards Institution. Another example is a recent draft specification for 35-mm projection lenses which makes provision for a barrel diameter of 80 mm, permitting a range of lenses working at  $F:1.4$ . This indicates the trend of new design.

The popular projection lens barrel diameter size in the past was 52.4 mm, but more recently with the introduction of  $F:1.9$  collecting systems and lenses to match, the 70.65 mm diameter jacket has become almost universal. There are, however, certain mechanical restrictions in some projectors which do not permit the use of this larger diameter jacket in all focal lengths.

Modern projection lenses are surface-treated and hermetically sealed, the inner optical surfaces are thus always clean, and the projectionist need only wipe over the external surfaces.

### Discussion:

*Question.* To what light does the quarter wave-length refer? Is the transmission selection according to the wave-length of light?

*Answer.* We generally coat the surfaces

(Continued on page 26)



# TELECASTS

## RCA's Kinephoto System for Tv-to-Film Transfer

**R**CA has given the first public demonstration of its new Kinephoto system for recording Tv images on motion picture film. The system consists of a Kinephoto equipment (Type TMP-20B) which is basically a projection-type kinescope, with its associated video amplifier, deflection circuits, and power supplies; and a suitable 16- or 35-mm soundfilm camera.

The equipment utilizes standard video signals supplied directly to the unit from the switching system in the Tv studio. The signal is fed to a video amplifier, where it is amplified and separated into a signal for synchronizing the scanning raster of the kinescope with that of the Tv pickup camera, and a modulating signal which is amplified and used to control the kinescope beam which forms the visual image.

A regulated power supply furnishes necessary plate voltages to all units, including the 25 kv required for kinescope operation. The control functions of the equipment are grouped on a central panel with metering circuits to indicate proper operating adjustments.

The kinescope (Type 5WP11) is a special 5-inch, flat-face aluminized, projection-type cathode-ray tube having a short-persistence blue phosphor screen of high actinic value, which makes possible the use of high-resolution, low-cost, positive-type film stock.

### Timing Difference Compensation

In addition to the Kinephoto unit, the system requires a 16-mm motion picture recording camera. This camera compensates for the timing differences between the Tv system, which has a scanning frequency of 30 complete frames or 60 interlaced fields per second, and the conventional motion picture system of 24 frames per second. Since 1/12 of a second is the time interval for five interlaced Tv fields and for two frames of film, compensation can be made by exposing each film frame for the duration of two Tv fields and advancing the film during an interval representing one Tv field out of five.

Because of differences in phasing, each film frame may represent parts of as many as three Tv fields, but a precision timing shutter and pull-down mechanism provides for precise matching between

the cutoff point in one field and the point of pickup in the next.

The camera exposure time in terms of the Tv system must be accurate to less than 1/2 scanning line, or roughly one part in 30,000. It must be timed to expose exactly the proper number of picture lines for each frame, or 525 lines, no more or less, or an effect known as "banding" will take place on the exposed film. This exposure is controlled by a mechanical shutter.

The camera and shutter are driven by synchronous motors which are synchronized with the entire Tv system. The shutter drive is isolated from the main camera drive, and a 3600-rpm synchronous motor drives the shutter at the necessary 1440-rpm through a set of precision gears. Another motor, synchronized with this, drives the film transport and intermittent mechanism. This arrangement insures rotational accuracy and freedom from inter-action.

### Density of Film Recording

The density of film recording depends not only on the length of exposure but on the brightness of the cathode-ray picture tube. Since the exposure time is fixed, the highlight brightness of the picture is varied by means of the video gain control; the kinescope bias control will set the black level or point of visual extinction of the return lines. The beam current of the picture tube is measured by a microammeter on the control panel of the monitor: since there is a direct relationship between this current and the light output of the tube, the measurement of the beam current provides a good index to the brightness of the picture.

Normally, the positive kinescope images are filmed on standard stock, producing negative film images which can be used for rebroadcast by reversing the video phase in the Tv camera. The negative is then available to produce as many positive prints as desired. For applications where quick processing and projection is required, such as in theatres, a

### Terrific CBS Tv Surge

Progress Report: Tv advertising volume on Columbia Broadcasting System for the first three months this year was 40 times (not 40% but 40 times) greater than for the comparable period during 1948.

polarity switch makes it possible to adjust the kinescope to produce negative images. Such images can be photographed and processed as direct film positives for immediate projections.

RCA asserts that with Kinephoto it is possible to project the finished pictures within 40 seconds after they are filmed. Using this technique, theatres could take pictures "off the air," rush them through processing, and use standard film projectors to show them as newsreels.

### 16-mm Wins Wide Acceptance

Either 16- or 35-mm cameras can be used with Kinephoto. The 16-mm film has been chosen initially because of the importance of costs of film stock and film processing, together with the safety problems involved, that 16-mm fine-grain films with suitable processing can produce excellent picture quality, at a cost of about 1/3 that of 35-mm film. Considering that it takes 1200 feet of film to record a half-hour performance, cost of film and developing is an important factor.

The camera can be equipped with RCA sound recording equipment to place the sound track and picture on the same film, or the sound signals may be fed to a separate sound recorder which permits editing, re-recording, and dubbing.

The Kinephoto system uses a power source of 110-120 volts, 60 cycles, 750 watts. The input impedance is 72 ohms. The equipment, exclusive of camera, is, in inches, 50 long, 26 wide and 56 high, and weighs about 500 pounds.

### New RCA Life-Size Tv System

A new life-size Tv projection system (TLS-87) featuring an optical barrel which for the first time is suspended from a convenient ceiling mounting, has been announced by RCA. Construction is such that all the equipment can be out of the way of the viewing audience.

In use, the optical barrel is focused on a screen up to 6- x 8 feet in size, of either front- or rear projection type. The optical barrel is connected to the control console by a 40-foot cable.

The TLS-87 has a 30-watt amplifier, with microphone and phonograph inputs provided so that the unit can be used as a public address system when Tv programs are not on the air. The amplifier also can be used in conjunction with a

record player or with wired music. Appropriate types of loudspeakers can be utilized to meet the requirements of various types of installations.

## Tv Will Help Not Hurt Movies, Says Paramount Video Head

Television has already indicated that it will be responsible for the ultimate elimination of the "B" picture but has thus far produced no serious competition for top quality film product, Paul Raibourn, Paramount, vice-president, told the Investment Bankers Association, in an address recently.

Raibourn expressed the opinion that "during the next several decades Tv will have become a feature in the American home without the slightest setback to all those other industries which satisfy the wants of leisure time, namely, the motion picture, the newspaper, the magazine, the automobile or the 'dress up' apparel business." Raibourn admitted that theatre attendance among video set owners had declined about 25 per cent, but said that this loss would eventually be more than recovered when video was used as a promotion medium for pictures.

### Sees Tv as 'Marvelous' Theatre Aid

"The Tv set in the home is going to be such a marvelous instrument for making people want to see motion pictures that one wonders sometimes if it wasn't just devised for that purpose," the Paramount Tv chief declared. "Only 15,000,000 of America's 148,000,000 see the average so-called 'A' picture. I feel ashamed of our advertising and publicity work when I give you those figures. But there are limitations to the static printed page in portraying the appeal of the action in our features.

"We believe that there is no way of making a person hungry as completely effective as that of giving him a small taste of a delectable dish. Through a Tv broadcast we will come into your home to show you just enough of a picture to make you hungry for the rest of it. And if you don't come to the motion picture theatre to see it after that, then either we have done a bad job or you are becoming old and blase. We will take care of the first part. We believe you will take care of the second."

### Fine-Grain 35-mm Positive for Tv

Substitution of low-contrast, fine-grain positive film for standard projection prints, and use of 35- instead of 16-mm film, would improve considerably the reproductive quality of televised motion pictures, according to James Gordon, ASC, (20th Century-Fox) in a paper presented to the American Society of Cinematographers Tv Research Committee.

The standard projection print has a high contrast and wide brightness range necessary for the theatre, which is more than the Tv transmitter can accommodate. Attempted adjustment results in empty shadows and monotonous high lights on the Tv receiver. In addition, the regular projection print is not a perfect reproducer of the negative

image. Gordon contends, further, that when Tv film producers can afford to use 35-mm film and equipment, instead of 16-mm reduction prints, the definition now lacking in televised films will be present.

In explaining the mechanics of kinescope recording, wherein a live Tv show is photographed, Gordon again feels that the use of 35-mm film will improve immeasurably the quality of reproduction, and will more nearly approximate the quality of the live show.

## New RCA Tv Tube Plant in Indiana

Work has begun on the new RCA plant in Marion, Indiana, in which 100,000 square feet of space will be added to the 160,000 square feet RCA already has in Marion for the manufacture of 16-inch, direct-view metal picture tubes for Tv. The new tube differs radically from previous Tv tubes in that it uses a metal cone or center section instead of an all-glass envelope.

## IA ELECTIONS

### LOCAL 165, HOLLYWOOD, CALIF.

Walter McCormick, *pres.*; Howard Edgar, *vice-pres.* (both elected unanimously); Richard Hennley, *sec.-treas.*; Jas. J. Eddy, *bus. rep.*; Frank Chaney, Paul R. Cramer, Richard B. Frisbie, Daniel F. Haworth, Harold Masser, *board dir.*; James Brigham, Wm. E. Hunger, *trustees*; Leo S. Moore, C. W. (Pat) Offer, Harold G. Swanson, *exam. board*; Jas. J. Eddy, Chas. Groman, Richard Hennley, Walter R. McCormick, *del. Central Labor Union*; Jas. J. Eddy, *del. Calif. State Fed. of Labor*.

### LOCAL 316, MIAMI, FLA.

Bob Lewis, *pres.*; Wm. Thaggard, *vice-pres.*; Frank Rauffer, *rec.-sec.*; Frank Lewis, *cor.-sec.*; Wm. Reardon, *fin.-sec.*; George E. Raywood, *bus. rep.*; Harry Raywood, *sgt.-at-arms*; Jack Shafer, E. E. French, Joe Cornphell, W. S. Roberts, *exec. board*; Bruce Burnell, M. Padula, D. Armstrong, *trustees*.

### LOCAL 433, ROCK ISLAND, ILL.

Edward Short, *pres.*; Mark M. Maston, *vice-pres.*; Fred Parker, *rec.-sec.*; Warren Castle, *fin.-sec.*; Fred Parker, *bus. rep.*; Lloyd Burrs, *treas.*; F. E. Wright, *trustee (3 years)*; Lloyd Burrs, *exec. board*; A. W. Young, *del. Iowa State Ass'n*; Edward Short, *del. Illinois State Ass'n*.

### LOCAL 486, HARTFORD, CONN.

L. H. Albee, *pres.*; Gus Soderburg, *vice-pres.*; Donald MacDonald, *cor.-sec.*; Pete Di Carli, *sec.-treas.*; Charles North, *bus. rep.*; Harry Avery, *sgt.-at-arms*; Tom Harries, Frank Panton, *exec. board*; Tom Pierce, *trustee*.

### LOCAL 571, PORTSMOUTH, OHIO

W. H. De Lotel, *pres.*; C. F. Etzkorn, *vice-pres.*; Roy W. Reeg, *rec.-sec.*; E. S. Gahm, *fin.-sec.*; O. H. Osborne, *cor.-sec.*; C. F. Etzkorn, *bus. rep.*; R. Osborne, *sgt.-at-arms*.

## Mass-Produce Tape Records

The final technical obstacle in the way of mass production of recorded music on tape has now been overcome. A machine has been perfected by Minnesota Mining and Mfg. Co., St. Paul, that can simultaneously reproduce 48 hour-long tape recordings indistinguishable from the master transcription in one hour.

These pre-recorded reels of tape will be designed to compete with disc records for use in the home, in broadcasting, in schools and theatres. Since many sound engineers contend that magnetic sound tape has better fidelity than any other known sound recording medium, it is to be expected that recorded music on tape may enjoy a competitive advantage over disc recordings, whether of the 78, 45, or 33 1/3 r.p.m. variety.

### Single or Double Tracks

Tape can be recorded with a single magnetic pattern in the center, or with a double pattern of two magnetic paths side-by-side on the tape. One path plays as the reel unwinds forward, the other path functioning when the tape reverses, which is accomplished automatically in a fraction of a second. The double pattern affords twice the playing time with the same amount of tape.

Reels having 600 feet of tape, double pattern, and a playing speed of 3 3/4 inches per second can be turned out at the rate of 48 per hour, each reel having a full hour's playing time. Reels with 1,200 feet of tape, double pattern, and a playing speed of 7 1/2 inches per second can be turned out at the rate of 32 per hour, each reel having one hour of transcribed material.

## New Lens Measuring Method

A new degree of realism in television, motion pictures and still photography may result from a new method of measuring contrast characteristics of both optical and electrical lenses which was described recently by Otto H. Schade, advance development engineer for RCA. It is also applicable to contrast measurements for different types of photographic film and television screen materials.

Employing what is essentially a Tv pickup and reproduction system, this method provides the optical and photographic industries, as well as the Tv field, with the first known practical method of analyzing and rating the ability of various types of lenses to show picture detail.

For industries developing or using image-forming devices, this method means the end of guesswork and, for the first time, permits objective selection of lenses that will produce the best results in various types of systems. Data on the

imaging power of the human eye have been incorporated in the procedure for plotting the overall response of lenses and other elements, so that the practical value of improvements in picture quality can be determined in terms of the observer's ability to detect them.

#### Expanded Power of Resolution

The theoretical values by which lenses have been rated heretofore, Mr. Schade explained, are based on their limiting or highest power of resolution—that is, the greatest number of lines of picture detail per mm which they can focus on film or viewing screen.

However, useful resolutions for photography and television are limited, respectively, by the response of photographic film and the width of Tv frequency channels. To improve picture detail within these limitations, the research engineer in these fields must strive for sharper contrast of light and dark picture elements within lower ranges of resolution—about 50 lines per mm in photography, and one-fifth as many lines in Tv.

The system developed by Mr. Schade affords the first practical means of determining the contrast response of lenses in these ranges, or in any specified range from zero to the limiting resolution.

#### H. P. Niemann Heads Hertner; C. Dash Ends 30-Year Span

H. P. Niemann has been elected president and a director of The Hertner Electric Co. He has served as vice-president and general manager of this Cleveland manufacturing



H. P. Niemann,  
recently named  
president of  
Hertner Electric Co.

plant for the past two years. He previously was executive head of The Askania Regulator Co. of Chicago, which, like the Hertner company, is a General Precision Equipment Corp. subsidiary.

Niemann succeeds C. C. Dash, who has retired after 30 years association with Hertner. H. P. Sherer, who has been serving as vice-president and chief engineer, has recently been elected a director.

Operating since 1901, the Hertner plant manufactures a-c and d-c motors and generators, battery chargers, and motor generator sets, with the Transverter being made especially for use in the motion picture field.

#### Ampro's 16-mm Planning Service

To answer important questions relative to the proper use of 16-mm high-intensity arc projectors, Ampro Corp. has announced a new planning and consultation service. Free

of charge for the asking, this Ampro service will advise on such things as audience size and seating arrangements, projection throw, screen size, equipment layout, sound hook-up, and many other factors which contribute to efficient 16-mm performance.

A brochure on 16-mm arc projection may be had by writing Ampro at 2835 N. Western Ave., Chicago, 18.

#### 286 Drive-In Spots Already Open

Reliable estimates indicate that the Easter weekend saw the opening for the season of 286 drive-in theatres, while about 325 others have fixed Memorial Day for their openings.

#### New Wenzel Projector Base

Designed especially for drive-in theatres, a new base (WB-600) has been produced by Wenzel Projector Co. This base permits an up-tilt angle of 25 degrees and a down-tilt angle of 28 degrees.

The base, made in two sections to facilitate handling, weighs about 350 pounds. On the front is a large shelf for tools, carbons, etc. The center of gravity is kept low and assures practically complete absence of vibration. The lamp sliding carriage is cast aluminum and is accurately machined so as to accommodate any present standard arc lamp.



## IMPART REAL SPARKLE TO YOUR PRESENTATIONS

# THE STRONG TROUPER

### *Portable High Intensity*

#### A. C. CARBON ARC SPOTLIGHT



**for theatres, auditoriums and night clubs where the length of throw does not exceed 100 feet.**

Produces a snow white uniformly illuminated spot, with crisp edges, far surpassing in brilliancy any incandescent or vertical arc type spotlight, and actually equalling many large theatre type spotlights. Supplies a sparkle to presentations obtainable only with high intensity arcs.

Easily operated.

A silvered glass reflector collects the illumination from the source and directs it to a circular aperture, from where it is projected to the stage by means of a two-element variable focal length lens system.

At 60 feet the size of the spot is variable from a 30-inch "head spot" to a 33-foot "flood".

Draws only 10 amperes from any 110-volt A.C. convenience outlet. A highly efficient, adjustable, self-regulating transformer which is an integral part of the spotlight base reduces the

current supply to a low arc voltage, for the first time making possible a high intensity arc spotlight without the use of heavy rotating equipment.

The carbons are fed automatically by an electric motor which maintains a constant arc gap. This results in a steady light, free from hiss or flicker.

A trim of carbon consists of two 6mm x 7" heavy copper coated high intensity carbons with a burning time of one hour and twenty minutes at 21 volts and 45 amperes arc current.

A horizontal masking control can be angled at 45 degrees in each direction from horizontal.

The color boomerang contains six slides and an ultraviolet filter holder.

Mounted on casters. Easily disassembled for shipment.

**SOLD BY INDEPENDENT THEATRE SUPPLY DEALERS.**

Use the coupon to obtain further details, prices and name of your nearest dealer.

**THE STRONG ELECTRIC CORP.**

"The World's Largest Manufacturer of Projection Arc Lamps"

14 CITY PARK AVE.  
TOLEDO 2, OHIO

Please send free literature, prices and name of the nearest dealer in Strong Spotlights.

NAME .....  
COMPANY .....  
STREET .....  
CITY and STATE .....

## British 35-mm Film Standard in Accord with U. S. Specs

Specifications for 35-mm theatre release prints which will constitute a British Standard have been announced by the British Kinematograph Society (B.S. 1492-1948). The Standard details requirements for reels, cue marks, leaders and trailers, and also makes recommendations on the protection of prints and the avoidance of emulsion pickup.

The specification is substantially in accord with American standards, except that an additional sound synchronizing mark is provided for use when reduction

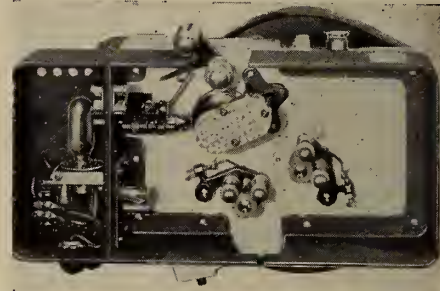
prints are made to 16 mm: this additional mark takes the form of a circle imposed upon a transverse line, 26 frames from the picture start-mark. The maximum length of reel is fixed at 2,050 ft.

### Wood Reel Cores Still Used

It is recommended that a protective band (e.g., of tough paper) be provided around every reel, and where transit spools (reels) are not provided, that a hardwood core shall be used. Edgewaxing or other treatment to prevent incrustation of gelatine is also recommended.

## New Soundhead by Wenzel

A new soundhead, the WSH-3, is now in production at Wenzel Projector Co. The head is supplied complete with a single-phase, 50-60 cycle motor operation on 110 volts, and the head is driven by two sturdy V belts. The photocell mounting has been



Interior view of redesigned Wenzel soundhead, WSH-3, now being distributed.

redesigned, and it is no longer necessary to purchase a mounting tube, the cell being connected by means of two binding posts. The cell can be changed within a few seconds time.

The motor table is attached directly to the center frame of the head and may be moved easily to insure belt tension at all times. The exciter lamp is of the prefocus type and is instantly adjustable without the use of tools.

An attractive illustrated brochure relating to this soundhead is available: address Wenzel at 2505 So. State St., Chicago, Ill.

## LENS DESIGN, MANUFACTURE

(Continued from page 22)

to have a maximum transmission and minimum reflectivity in the apple-green part of the spectrum at about 5,500Å. Away from that minimum position, you do get a certain amount of light reflected.

**Q.** If you coated for a particular wavelength, what percentage gain would you expect for a particular monochromatic light?

**A.** There is a condition that the refractive index of the film should be the square root of the refractive index of the glass. It is not possible to obtain that condition precisely, because there are not many minerals of a suitable type for evaporating on to the glass surface. We have to use magnesium fluoride.

**Q.** How does the reflectivity curve continue into the infra-red? At 12,000Å would there be any improvement with coated lenses?

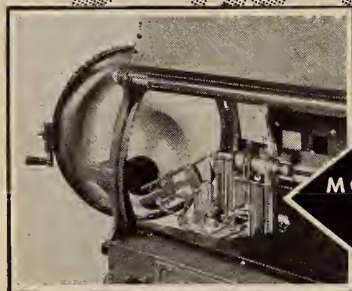
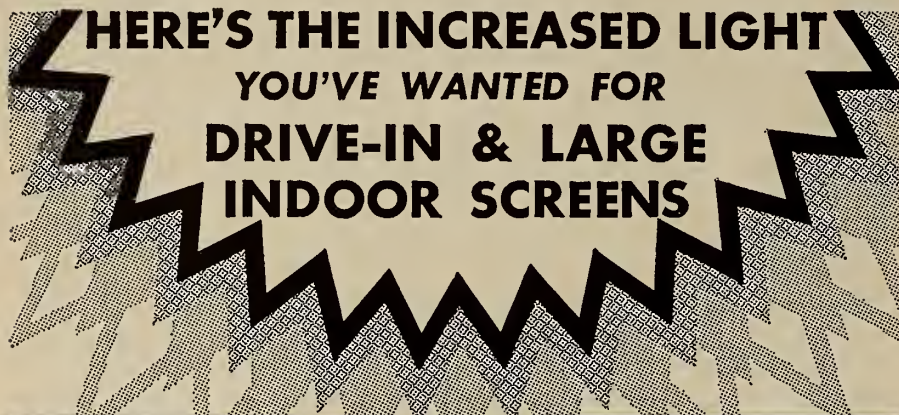
**A.** Yes, there would still be a considerable improvement. It is possible by evaporating successive layers of different minerals to attain an achromatic effect.

### Light-Collecting Facilities Lagging

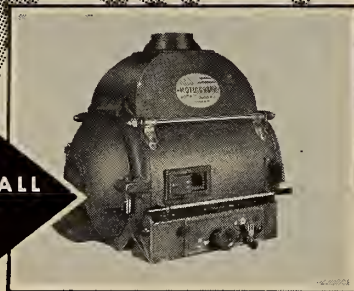
**Q.** Is it likely that faster aperture lenses than are now available will come into use soon? If that is so, it will mean re-designing the collecting system of the arc lamp.

**A.** The case is really that the light collecting end of the system is lagging behind the projection lens. The wider the angle of pickup the greater the trouble with heating.

**Q.** Regarding the desirability of matching



THE  
NEW  
**MOTIOGRAPH-HALL**  
75/115 AMPERE  
HIGH INTENSITY  
REFLECTOR  
TYPE ARC  
LAMP



Operating at 85 amperes, the Motiograph-Hall produces 19,000 lumens—more light than condenser-type high intensity lamps operating at more than twice this amperage.

A rotating positive carbon (an exclusive feature) permits even burning of the carbons and a proper crater form.

Due to the extremely high intrinsic brilliancy of the Motiograph-Hall arc, the total light output contains a much larger percentage of visible light, making unnecessary the use of a filter which would reduce the amount of visible light passed.

The automatic focus control, another exclusive feature, constantly holds the crater of the positive carbon at the exact focal point of the mirror, preventing variations in the character of the light at the screen.

The Motiograph-Hall lamp is designed to use 9-mm. or 11-mm. high intensity positive carbons and 5/16" negative carbons, the cost of which is about one-third that of the cost of the larger carbons used in condenser-type lamps operating in the 140-180 ampere range.

Other Motiograph products include Motiograph 1 K.W. and 46-ampere high intensity arc lamps, Motiograph projectors, indoor and outdoor sound systems, generators and rectifiers, in-car speaker equipment and junction boxes, ramp switching panels for drive-ins, turntables, etc.

Literature and Complete Information May be Obtained from

**MOTIOGRAPH, INC., 4431 W. LAKE ST., CHICAGO 24, ILL.**

apertures from the mirror to the lens, recent papers in American journals have suggested that the illumination at the edges of the picture is improved if the projection lens is of wider aperture than the mirror. What are Mr. Anstis's views on this subject?

A. I think that one American writer was endeavoring rather to point out that certain American projection lenses gave some cutoff of light due to their improper design. You have that case in some American projectors using  $F:1.9$  lenses giving only  $F:1.9$  at the center. If you are free to increase the diameter, you will get  $F:1.9$  at the margin. (See *Editor's Note following this discussion*)

Q. What do you consider is a natural basis for the calibration of lenses in transmission values?

A. The old basis was the relation of the diameter of the lens to the focal length. This gave the  $F$ -value. That does not take into consideration the transmission of the lens. If one imagines a lens of 100% efficiency, that is the theoretical basis of the  $T$ -scale.

Q. Am I not right in thinking that the coating is not permanent? The  $F$ -number of a lens is permanent, but the  $T$ -scale would vary in time.

A. Modern coatings are hard and substantial. Over a number of years the transmission would not vary appreciably.

Q. How is an aspherical surface produced?

A. They cannot be produced in the manner as for ordinary lens surfaces. The grinding and polishing tools when producing spherical surfaces oscillate in a free motion over the top of the lens. In making aspherical surfaces, one has usually to depend on some kind of a formula or link mechanism for producing the curvature mathematically.

[EDITOR'S NOTE: This is undoubtedly a reference to IP in which have appeared several penetrating articles on the topic of "matched" optics, notably those by Dr. John L. Maultbetsch (Kollmorgen Optical Co.), and by R. H. Mitchell, regular contributor to IP.]

## SMPE CONVENTION ROUNDUP

(Continued from page 17)

and the conclusion is reached that a substantial increase in screen illumination may be obtained by these methods, such increase being from 30 to 60% beyond the present safe maximum.

### ELECTRONIC PROJECTION LAMP

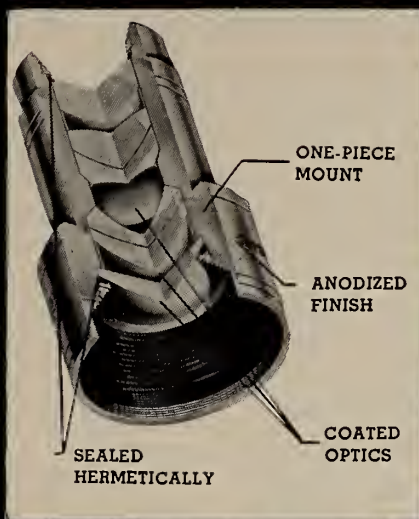
J. K. Elderkin

Forest Electronic Company

A major problem in the operation of arc lamps for projection is the feeding of the two carbons as they burn. In general, it is held, present motor-driven arc feed mechanisms do not maintain the crater in correct focus for any considerable time and do not maintain a constant arc length, thus requiring almost constant attention by the projectionist.

A new lamp mechanism with completely separate feeding mechanisms for each of the carbons has been developed. Feeding rates of each carbon are controlled independ-

# $f/1.9$ SUPER-SNAPLITE



Question Box

No. 3

## DOES THE $F/1.9$ SUPER-SNAPLITE HAVE A TRUE SPEED OF $F/1.9$ ?

Yes—in all sizes from 2" up through  $4\frac{3}{4}$ ". The 5" size has a speed of  $f/2.0$ .

## WHY DOES THE 5" SUPER-SNAPLITE HAVE A DIFFERENT SPEED FROM THE SHORTER FOCAL LENGTHS?

Because of the limited space in the projector. In other words, a 5" lens with a speed of  $f/1.9$  would not fit into present projectors because of the large diameter needed for the lens barrel.

## DOES THE SUPER-SNAPLITE LENS HAVE DIAPHRAGMS?

No—the full aperture is utilized in all focal lengths.

## DOES A FAST LENS ELIMINATE THE "HOT SPOT"?

To a very large extent. The faster the lens, and the higher its quality, the more uniform the screen illumination will be.

## IS THE "HOT SPOT" WORSE WITH SHORT FOCAL LENGTH LENSES?

Usually. The falling off in illumination at the corners can be quite severe with poor lenses. This problem was given full consideration when Super-Snaplite lenses were designed. Even in the shorter focal lengths, they give remarkably even screen illumination.



"You Get the Most Uniform Light with Super-Snaplite"

**KOLLMORGEN**

2 Franklin Avenue  
Brooklyn 11, New York

Optical



CORPORATION

ently and with extreme accuracy by employing a nearly constant speed a-c motor as the driving means for each mechanism and a separate electronic pulse generator for each feed motor. Any desired feeding speed may be obtained simply by adjusting the number of pulses per minute fed to the motor.

To accomplish these results a very accurate electronic impulse generator energized from the 110-volt illuminating current supply has been devised. The paper also discusses the Suprex, simplified high-intensity, high-intensity and electronic type arcs.

#### THE SOCIAL IMPACT OF TELEVISION

Ralph B. Austrian

In the New York Metropolitan area, a

14½% saturation point in regard to homes with Tv has already been reached, and the outlook in this area is for a saturation point of between 90 and 100% in no more than five years, barring external interference. An important need today is the production of a receiver to retail complete at between \$100 and \$125.

Judging by the effect of sound on silent motion picture theatres, network radio, as it exists today, is about to enter the first stages of a rapid decline. A recent survey shows a decline in motion picture attendance among Tv set owners ranging from 23 to 36%. Similarly, radio listening among these people has declined drastically.

Tv has already been reported as cutting into motion picture attendance at the rate

of about 500,000 admissions per week, a loss, even today, of some \$243,000 each week at the box-office. Even this seemingly small figure is of extreme importance. The motion picture industry cannot preserve its present state of prosperity by doing nothing. Tv is an ideal medium for the advertising of motion pictures. It is imperative that the engineers of the motion picture industry turn ever increasing attention to the technical phases of Tv.

#### 16-MM FILM COLOR COMPENSATION

O. Ken Kendall

National Film Board, Canada

Second-generation color duplicates in 16-mm are so noted for problems of contrast and color fidelity as to be responsible for a widespread practice of printing from the original. Release printing from originals having the required corrections would probably involve too many operations to be economically feasible. Techniques and equipment have therefore been devised for making at reasonable cost a key film from which release prints may be made.

These key films seek to require conventional timing to maintain general color-casts of significant images on a scene-to-scene basis, to retain transmission brightness relative to other hues in the same frame, retain detail in under-exposed shadows and limit the increase in contrast that may occur with each generation of printing from reversals. A chart is given showing various settings for blue, green and red in the printer which compensate for different faults in the original.

Test duplicates made from key masters in the manner described have demonstrated the same contrast as the original, less color distortion than the original considered on a scene-to-scene basis, superior color than an original over-exposed throughout a shot, and more natural color for the shadow sides of faces, than in conventional first-generation prints.

#### APPLICATION OF MAGNETIC RECORDING TO MOTION PICTURE TECHNIQUES

J. G. Frayne and H. Wolfe  
Western Electric Company

The background of magnetic recording is discussed, starting with the experiments of Poulsen in 1898. In 1941 the work of Bell Telephone Labs enabled production of the first high-quality magnetic recorder available to the public.

A d-c bias applied to magnetic recording makes it possible to record over a large portion of the magnetization curve without appreciable distortion. However, d-c bias does not give sufficiently outstanding quality nor a sufficiently good signal-to-noise ratio. A-c bias has, therefore, been generally used in contemporary magnetic recording systems.

The Germans, during the war, developed the Magnetophon, which used plastic tape with an impregnated or coated layer of a magnetic iron oxide powder and gave quality superior to that of all previous magnetic recorders. The experience gained from study of this equipment made it apparent that magnetic recording could be adapted to

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motion picture recording at the relatively low speed of 18 inches per second.

It was necessary that frequency response, signal-to-noise ratio, and flutter performance be at least comparable to recordings made by optical means. This has been accomplished in the new Western Electric method. The magnetic recorder utilizes the RA-1231 photographic film recorder as a basis, using a number of added or substituted conversion parts. The recorder may also be used for photographic recording.

The method of installing the magnetic parts is described. Recordings are made on a 250-mil wide track 0.450 inch from the edge of the film. If desired, the recorder itself can be employed as a reproducer. The design of the magnetic heads is described, as are the recording transmission system and controls and the use of pre- and post-equalization. Flutter measurements indicate total flutter to be about 0.1%.

The RA-1251B rerecorder has similarly been adapted to magnetic operation. This equipment may be used for both recording and playback. The RA-1435 theatre type sound reproducer has also been adapted to magnetic operation to provide review room facilities.

The conclusion is made that recordings of music and dialogue made on this system show an excellence of quality unsurpassed in any previously known recording system.

#### 16-MM SOUNDFILM PRACTICES

John A. Maurer

J. A. Maurer, Inc.

Numerous improvements in the technique of producing 16-mm soundfilms and in reproducing the sound tracks make possible today a substantially higher quality than is generally obtained commercially at present. Recognition of this fact, coupled with a demand by the Tv industry for 16-mm sound of consistently high quality, has led to a proposal that the industry adopt a standard 16-mm reproducing characteristic.

This proposal, it is believed, would make it possible for 16-mm sound to be of substantially the same quality as 35-mm sound as commonly heard in theatres.

This paper presents an analysis in engineering terms of substantially all the factors known to be measurable or calculable which determine what quality is possible with 16-mm sound films, assuming that cost of reproducing equipment is not a primary limiting factor. While a wide frequency range is desirable, noise and distortion must be taken into account in determining how wide a frequency range it is practical to use.

Various factors in recorder design are discussed from the standpoint of their contributions to overall noise and distortion, and a similar analysis is made of the various elements in the sound reproducer. Different systems of recording, such as negative-positive variable area and variable density, and direct positives, are compared. The effect of film laboratory processes on overall quality is discussed in considerable detail.

#### 16-mm Film Now Threatens 35-mm

The conclusion is reached that at the present time the well-accepted standard of 35-mm theatre sound quality can be equaled,

using 16-mm films and equipment, with relatively little difficulty, and that where a higher standard of quality is required, as may be the case in Tv film production, it can be obtained if more than ordinary care is exercised in the work of the film laboratory.

The various points brought out in the discussion were illustrated by the use of 16-mm films re-recorded from an original master record on magnetic tape, which includes the entire audible frequency spectrum and has very low distortion.

Samples of speech, music, and sound effects from this high-quality original are re-recorded to film using the various techniques discussed, and these records are reproduced in such a way as to simulate the effect of different reproducing systems and characteristics by the use of a high quality 16-mm playback and electrical filters which modify its characteristics in known ways.

#### WATER-COOLED, HIGH-PRESSURE MERCURY DISCHARGE LAMP FOR D-C

W. Elenbaas and E. W. van Heuven  
Philips Lamp Works, Holland

A water-cooled high pressure mercury lamp operated on d-c is described, which has been in use in motion picture projection for many years and which is a powerful light source. The lamp has a bore of somewhat less than 2 mm and an arc length of 12½ mm. It may be loaded continuously at 1000 watts and has a brilliancy of 50,000

stilb in the axis. With a lamp of double length consuming 2 Kw the illumination level may be increased considerably.

#### HALF A MILLION STATIONARY IMAGES PER SECOND WITH REFOCUSED REVOLVING BEAMS

C. D. Miller

Battelle Memorial Institute

A motion picture camera has been developed in the laboratories of the National Advisory Committee for Aeronautics which has made photographs of combustion phenomena in an engine cylinder at 500,000 frames per second.

In this camera the film remains stationary while the beam from a rotating mirror sweeps across fixed refocusing lenses, providing an effect similar to that of still cameras with high-speed shutters timed to open at slightly different times.

Recent studies show that knocking com-

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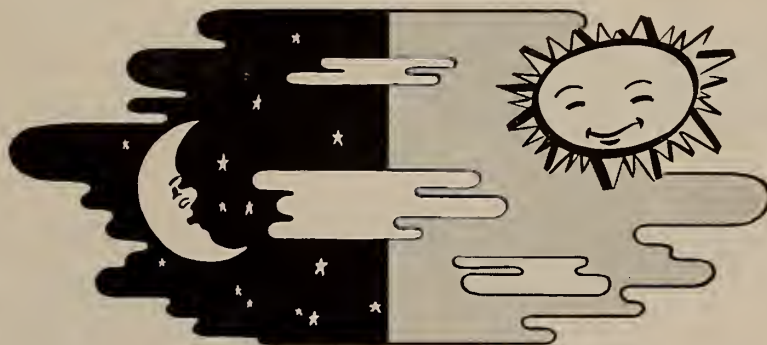
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bustion in an engine often involves detonation waves traveling more than a mile a second. The photographs obtained with this camera have provided valuable new information on engine knock. It is believed that

redesign of the camera will provide improved definition, and the camera should find wide application in the study of explosion and detonation phenomena, shock waves, ballistics, rapid stress changes in mechanical parts as observed by photoelasticity, and even the action of very small high speed mechanism.

#### OBJECTIVES OF F:1 APERTURE AND GREATER

Edward K. Kaprelian

Progress during the past 60 years has enabled the relative aperture of a well-corrected objective for normal field of view to be increased from about  $F:5$  to about  $F:1.4$ . The factors involved in the design of large-aperture objectives and some of the general approaches to the reduction of various aberrations are presented. Both refracting and reflecting systems are considered, including objectives having spherical and aspherical surfaces and those employing the immersion principle. Applications, testing, and performance of extreme aperture objectives are discussed.

#### PRECISE LENS CALIBRATION

(Continued from page 15)

standard diaphragms give an accurate indication of the amount of light transmitted. The second curve, on the other hand, will not in general be a straight line unless the marked  $F$ -numbers are accurate in terms of light transmission or are affected by a constant error.

The  $T$ -number corresponding to a marked  $F$ -number is then obtained by locating the point on the first curve where the scale deflection is the same as that for the given  $F$ -number. The value of the abscissa for this point is the corresponding  $T$ -number. An approximate

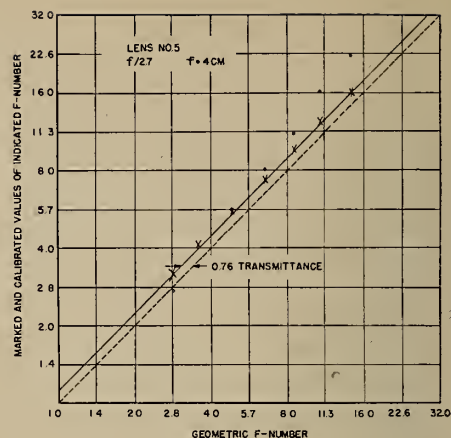


FIGURE 2

measure of the light losses within the lens may be obtained directly from the lateral displacement of the two curves.

The errors in marking the stop numbers of the lenses under study were also carefully investigated, with particular attention to those arising from errors in focal length and effective aperture, either separately or together. It was found that the magnitude of these errors was frequently as great as the difference between stop openings at the larger  $F$ -numbers.

#### Coordination of Data

In connection with this phase of the investigation, a method was developed for presenting all calibration information on a single graph (Fig. 2). The intervals between successive stop openings are equal and can be taken as a unit on each scale.

The marked values of the  $F$ -numbers (indicated by circles on the graph) and the values of the calibrated  $F$ -numbers, or  $T$ -numbers (indicated by crosses), are plotted against the true geometric  $F$ -number (the quotient of measured equivalent focal length and measured effective diameter of the stop opening). A straight line is drawn through the crosses, and a dotted diagonal line with unit slope is also drawn.

If there are no errors in the marked  $F$ -numbers—that is, if the indicated  $F$ -number equals the true geometric  $F$ -number—all the circles will fall on the dotted line. On the other hand, if the circles do not fall on the dotted line, the error in  $F$ -number can be easily estimated from the curve as a fraction of the interval between stop openings.

All of the crosses would also fall on the dotted line if the transmittance were 100%. The displacement of a cross from the dotted line is thus a measure of the transmittance of the lens at that stop opening. If the crosses fall on a straight line parallel to the dotted line, the calibration is consistent and the measurement of the true geometric  $F$ -number is correct.

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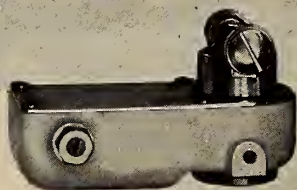
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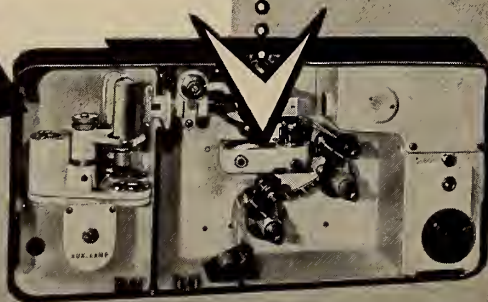
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## THE USE OF FILMS IN Tv

(Continued from page 14)

era shutter remains open for exactly two Tv fields, closes for exactly  $\frac{1}{2}$  field while the film is advanced, then opens again for the exact equivalent of two more Tv fields (actually  $\frac{1}{2}$  plus 1 full plus  $\frac{1}{2}$  field). It then closes for  $\frac{1}{2}$  field while the film is advanced a second time, and again opens at exactly the beginning of the next field. The two non-symmetrical cycles are then repeated.

One serious objection to the mechanical shutter for Tv picture recording lies in the need for perfect synchronization between the motor that drives the shutter and the Tv frame-rate generator which may not necessarily operate from the same 60-cycle a-c current power line. The shutter action is critical in that it must rotate with extremely low flutter content, since minute changes in angular velocity will result in banding, the effect of over- or under-exposure of scanning lines adjacent to the cutoff point.

With the electronic shutter now being used with some installations, this problem is minimized because the Tv picture tube is electronically blanked or turned off at the end of each 525 lines (one complete Tv-frame cycle) and is not turned on again until the film has been pulled down and brought to rest. Also, the electronic shutter can accommodate any film-frame rate less than a given maximum determined by the practical limitations of film-pulldown time.

### Equipment Choice: 16- vs. 35-mm

The majority of Tv film recordings are made on 16-mm rather than 35-mm film. The major reason is economic, since the cost of 35-mm film is somewhat more than three times the cost of 16-mm per unit of recording time. The current quality of Tv images, which undoubtedly will undergo gradual refinement, is considered to be roughly equivalent to 16-mm home motion pictures.

No marked improvement, however, is to be had by recording on 35-mm rather than 16-mm film at the present time. With the use of fine-grain, high-resolution, 16-mm-film emulsions, no loss of resolution in recording the Tv image is noticeable.

Fire regulations covering the use of 35-mm film, which apply regardless of whether the film is acetate safety base or the combustible nitrate base, are rig-

orous. The cost of providing space that meets these regulations is extremely high and the changes needed in existing space are difficult to accomplish. Sixteen-mm films are available only in acetate safety base which is classified by the Underwriters' Laboratories as having a safety factor slightly higher than that of newsprint. The use of 16-mm films, therefore, is not restricted by fire regulations.

It should be noted that in New York City these restrictions apply to space in which equipment capable of operating with 35-mm film is installed, so in order to forestall trouble, all equipment should be single-purpose, 16-mm equipment rather than dual-purpose, 35-mm or 16-mm equipment.

Another factor in the choice of 16-mm film is the high cost of 35-mm projection equipment. Most Tv stations are providing projection facilities for 16-mm film only for this reason. In order to service these stations with syndicated programs photographed from the picture tube, 16-mm prints will be needed.

### Emulsion Spectral Characteristics

There are three general classifications of film emulsions in terms of their spectral characteristics and they can be matched to the phosphor spectral char-



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acteristic of the Tv picture tube, for greatest actinic efficiency.

1. Panchromatic emulsions are most sensitive in the range from the ultraviolet (4000 angstrom units) through the red (7000 Å). The spectral response of these

emulsions corresponds approximately to that of the eye and so are generally used for direct photography;

2. Orthochromatic emulsions are sensitive from the ultraviolet through green (5700 Å) and are used in direct photography where it is desirable to reduce the red sensitivity;

3. "Ordinary," blue-sensitive emulsions, respond to the ultraviolet and blue portions of the light spectrum. This type of emulsion is used in coating films and papers generally employed in making positive prints from negatives. It is economical in comparison to the panchromatic and orthochromatic types. Another advantage is the ease of handling as relatively bright safelights may be used.

#### Picture Tube Phosphors

To match these film characteristics, picture-tube phosphors are available with light output ranging from the ultraviolet through the entire visual spectrum. Three types of phosphors in common use in television techniques are as follows:

1. P1, green fluorescence, commonly used in oscillographic work. It is the most efficient visually, but has poor actinic efficiency.

2. P4, white fluorescence, used for b-and-w reproduction of Tv images in most home receivers. It has the advantage in picture-tube photography that picture quality is most readily judged visually.

However, some P4 screens have undesirable decay characteristics.

3. P5 and P11, these two phosphors are blue with high ultraviolet output. Photographically they are very efficient. There is the difficulty in using a blue phosphor in judging the quality of image visually, because of the fact that the human eye has a low response in the blue region and cannot evaluate the quality of the ultraviolet component of the image-light output at all.

Tests have indicated that for recording of Tv images a blue-fluorescing screen (P5 or P11) is desirable, since it makes possible the use of high-resolution, low-cost, positive types of film stocks. The P5 screen has excellent persistence characteristics but produces a somewhat lower light level than that which can be obtained with P11.

Emulsion position in the final print is of importance in Tv because films may be spliced with other films for special purposes. The use of a nonstandard emulsion position requires a change of focus in the film projector when interspliced with films using a standard emulsion position. This would require the constant attention of the projectionist to maintain optimum focus throughout the spliced film, therefore it is advantageous to insist upon a standard emulsion position for all film to be used in Tv. The American Standard for 16-mm film is emulsion "toward the screen."

In the recording of Tv images there are several methods of obtaining the final print:

#### Obtaining the Final Print

1. The use of reversible film stock in photographing a positive cathode-ray-tube image. A dupe negative may be made of this material from which additional prints can be made. The prints then have standard emulsion position;

2. Photography using high-contrast positive stock and a negative picture-tube image resulting in a positive print from which dupe negatives may be made if production prints are required. These prints will have standard emulsion position;

3. The use of a positive image, photographing with a negative type of film from which final prints are made, resulting in a non-standard emulsion position. (By reversing the direction of horizontal scanning, however, the original negative may be made to have the same emulsion position as that of a dupe negative. Prints made from this negative then have standard emulsion position.)

When production prints are required Method 3 is now used almost exclusively since it eliminates the use of a dupe negative and consequently introduces less total degradation. Methods 1 and 2 do not produce production prints of suitable quality for present-day commercial Tv.



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(Continued from page 10)

ating corrosion of the metal. The condition of the flexible asbestos-insulated cables must also be checked, for these cables, being composed of many fine strands of wire, are particularly liable to oxidation.

The cut-out points of arc relays may be touched up by drawing 00 sandpaper between them while lightly pressing them together. (For routine cleaning use heavy writing paper in place of the 00 sandpaper. *Never use emery paper!*)

Check the feed-motor rheostat and then proceed to the feed motor itself. Clean and check the condition of the commutator and the brushes. If the commutator is scored, touch it up with 00 sandpaper followed with writing paper. *Do not use emery paper or cloth on commutators!*

14. LAMP OPTICS. Mirrors and condensing lenses must be taken out of the lamphouse for thorough cleaning. The very gentlest handling of these optical elements is the best protection against accidental breakage. Approved cleaning methods for lamphouse optics have already appeared in IP<sup>1</sup>. Damaged and defective mirrors should be replaced without delay.

The projector optical train may now be lined up by any of the usual methods—passing an aligning rod or stretching a string through the optical centers of the components, or simply sighting

<sup>1</sup> "Optical Efficiency in Projection," IP for May, 1948. Refer to the section headed "Optical Surfaces Cleanliness" on p. 6 of that issue.

through the machine. The arc should not be struck until the generator or rectifier has been checked.

15. GENERATORS OR RECTIFIERS. Check the condition of the ballast rheostats and their connections. When the current-supplying device is a motor-generator set, proceed as follows:

Turn the generator over by hand to note the "feel" of the machine. Carefully blow out all dust from the interior. Examine the commutator and the brushes for wear and defects. Clean the commutator, scrape away all dirt from the mica spacers between the copper bars, and dress the commutator by applying a *mere trace* of petroleum ("Vaseline") to its surface. Correct improper brush tension.

Grease the generator per manufacturer's instructions. Run-in the generator for 30 minutes before drawing current from it.

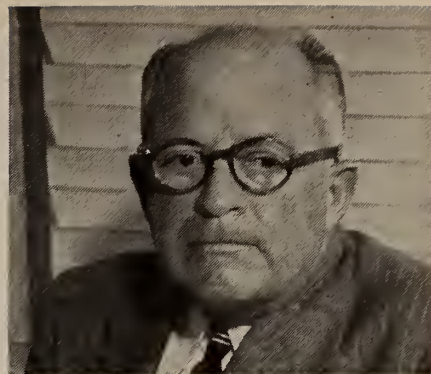
If the current-supplying outfit is a rectifier, clean the cabinets and note the condition of the chemical stacks, blower motors, etc. In the case of tungar-type rectifiers, test all tubes for plate current and replace the weak ones.

All switches not previously examined should now be checked. Familiarize yourself with the switchboards, fuse blocks, etc., and replenish the supply of spare fuses.

16: LIGHT TEST. Burn-in a new trim of carbons in each lamp. Adjust the arc-feed mechanisms to maintain the correct arc gap.

Project blank light to the screen. (Guard against lens injury by running the projectors, if rear-shutter models, and employing only brief flashes of light for the test.) Adjust the reflector for the most uniform screen illumination, and adjust arc-mirror distance to obtain the brightest light. Now adjust the arc-indicator so that the image of the positive crater coincides with the line on the arcoscope card.

Adjustment of mirror-aperture distance may be necessary in some cases, espe-



CAROLA. NATHAN—Co-Partner, Marina and El Presidio Theatres, San Francisco, Calif.—says:

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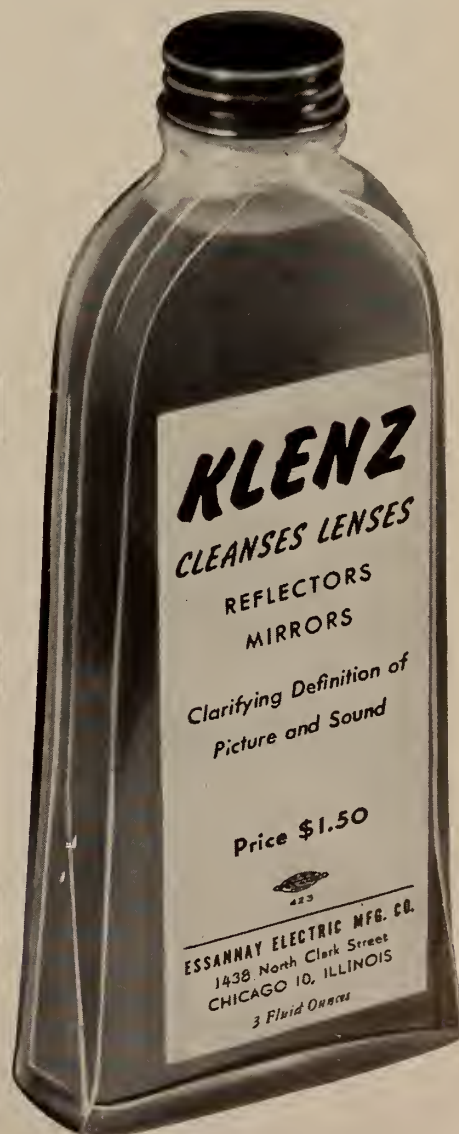
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cially when the light output of the projectors is not balanced.

With the lens-holder of each machine loosened and the focusing carriage in midway position, move the lens in or out by hand until a sharp image of the aperture edges is projected on the screen. Then carefully pull the lens out toward the screen until the aperture image is only *very slightly* blurred. Tighten the nuts of the lens-holder with the lens in this position.

If necessary, make pedestal adjustments so that the projected fields of both projectors coincide on the screen. Mentally note desired changes in the placement of the screen masking battens.

17. SCREEN AND CURTAINS. Make the necessary changes in the screen masking and note the condition of the screen. Dust spots may sometimes be brushed away with a soft brush or clean cloth.

Check grand-drape and title-curtain controls, and ascertain the closing time of the title curtain—information needed for “cueing” films.

Check striplights, footlights, *etc.*, for burned-out bulbs and bulbs of the wrong size or color. Make certain that all projection and observation port glasses are of the best quality and *scrupulously clean*. (See “Emphasis on the Port Side” by A. Buckley, IP for January, 1949, p. 12.)

18. PICTURE TEST. Use a good-quality print for test purposes. Before threading up, however, check the timing of the occulting shutter. Bring the manual shutter adjustment to the midway point. Free the shutter on its shaft.

Place a reference marker over any tooth of the intermittent sprocket when at rest. Turn the mechanism by hand, and when the second tooth from the first comes under the marker, turn the loosened shutter to mid-occultation position. Tighten the shutter screws. (See adjacent boxed comment on shutter blade width.)

Set the framer midway and thread up the reel of film. Project the picture and sharpen focus and framing adjustments. Note carefully any defects which require correction—the adjustment of the lateral guide rollers, for example. (There is no need for sound during this test.)

19. SOUND SYSTEM AND SOUND TEST. It is assumed here that the complex tests and adjustments necessary in connection with the sound system will be made by a sound service engineer. The projectionist not having the benefit of sound service ordinarily must rely on the usual circuit- and tube-testing methods. The focus of soundhead optics may be set by the “flicker-test” method.<sup>3</sup> The lenses of the optical tubes must be cleaned from time to time, of course, but care should be taken not to disturb the focus.

A final check-up on the sound may be conducted by running films in both projectors simultaneously and switching the fader back and forth to determine whether the output level of both machines is the same. The closeness of the “match” should be within ½ db. Sound quality, particularly the clearness of the

<sup>3</sup> See “Control of Sound-Film Reproduction,” IP for July, 1948, p. 5. The flicker test is given on p. 7 of that issue.



S. EDWARD KAPNER—Owner, Park Theatre, Philadelphia, Pennsylvania—writes:

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higher tones, should be checked from the auditorium.

The correlation between correct “average” auditorium and projection-room monitor volume levels may now be established.

All is now in readiness for a complete 2- or 3-reel picture-and-sound rehearsal which will provide practice in opening and closing the show and in making changeovers.

20. AUXILIARY APPARATUS. A check of film rewinders, splicers, storage cabinets, stereopticons, spotlights, *etc.*, is in order. The non-synchronous phonograph is also to be examined for mechanical and electrical defects. Frequency response changes may be necessary when disk reproduction is unsatisfactory.

Projection preparations in drive-in theatres are comparatively simple. This type of theatre is a fairly recent innovation, hence the projection equipment installed in such operations is comparatively modern. Sound tests in drive-in theatres include a check of all plug-in boxes and in-car speakers.

Screen problems, too, are different from those in permanent theatres. Evidences of weathering on the screen surface call for a repainting of the entire screen.

The suggested procedure for lining up the equipment in the “permanent” type of theatre is applicable in a general way to drive-in and “temporary” theatres. The projectionist assigned to a summer theatre can make certain of conserving time and effort by taking this copy of IP along with him, or else jotting down in his notebook the numbered capital-letter headings of the 20 steps presented herein.

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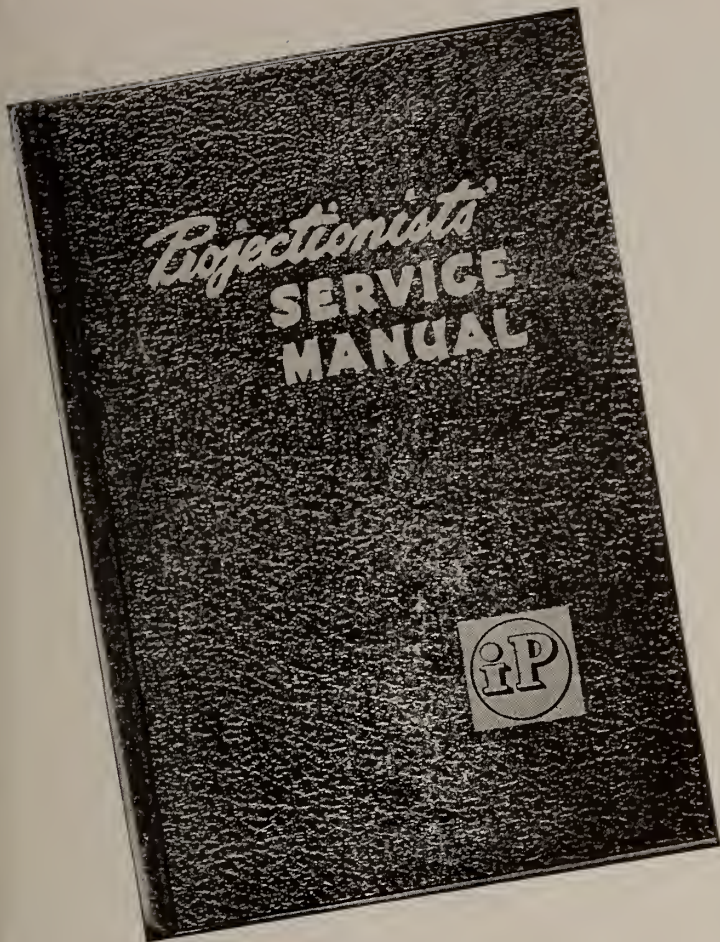
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MAY

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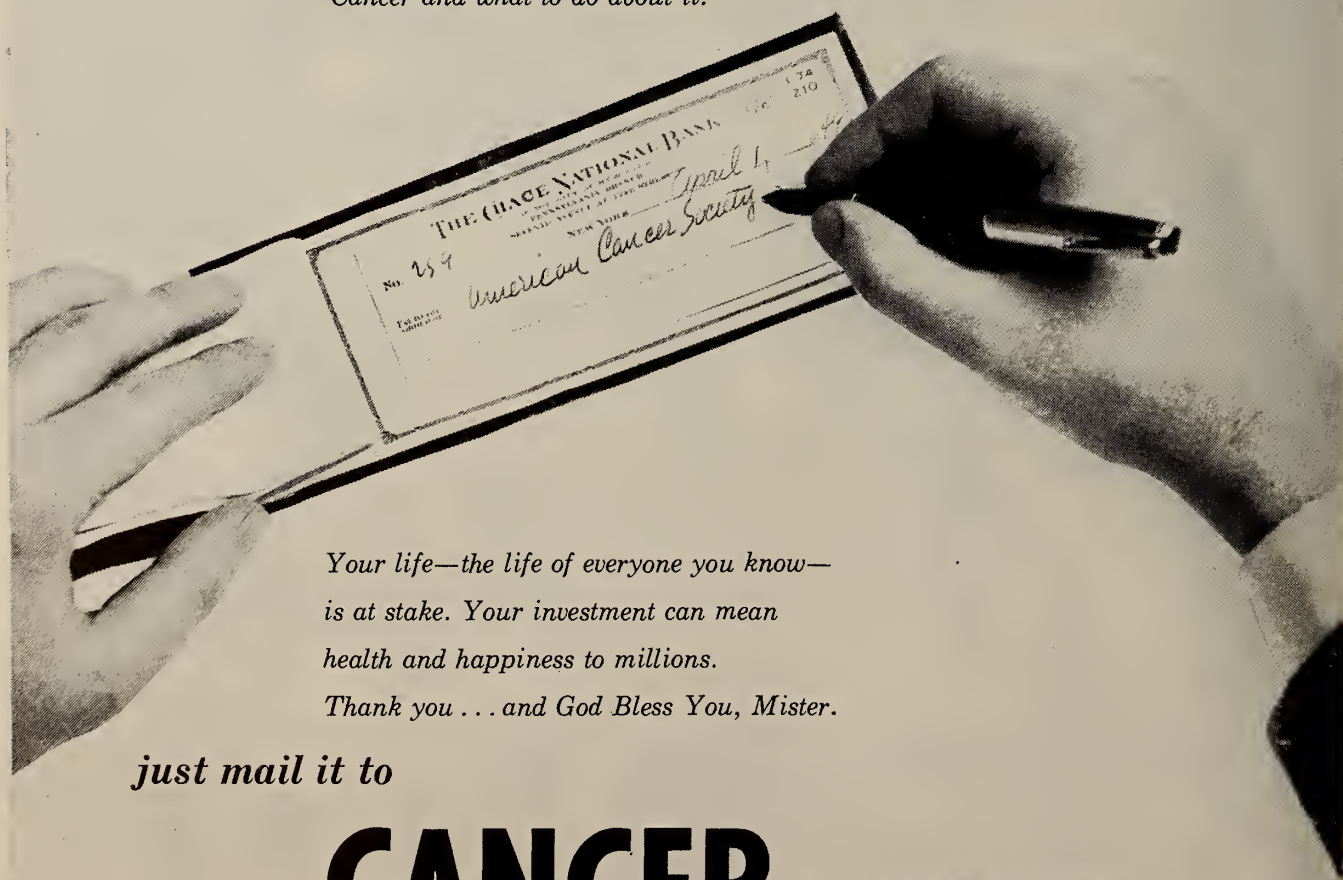
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# INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING



HENRY B. SELLWOOD, *Editor*

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MAY 1949

Number 5

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## MONTHLY CHAT

RECENT joint efforts of the Theatre Owners of America and the SMPE to formulate a practical plan for theatre television was ridiculed by a streamer-headed story in *The Film Daily*, the Washington correspondent of which quoted a "source close to the Federal Communications Commission" as stating that it was "preposterous" for the theatre field to expect the allocation of exclusive channels for the transmission of motion pictures to theatres. The story added that the opinion was in line with the oft-expressed views of the FCC anent "freedom of the air."

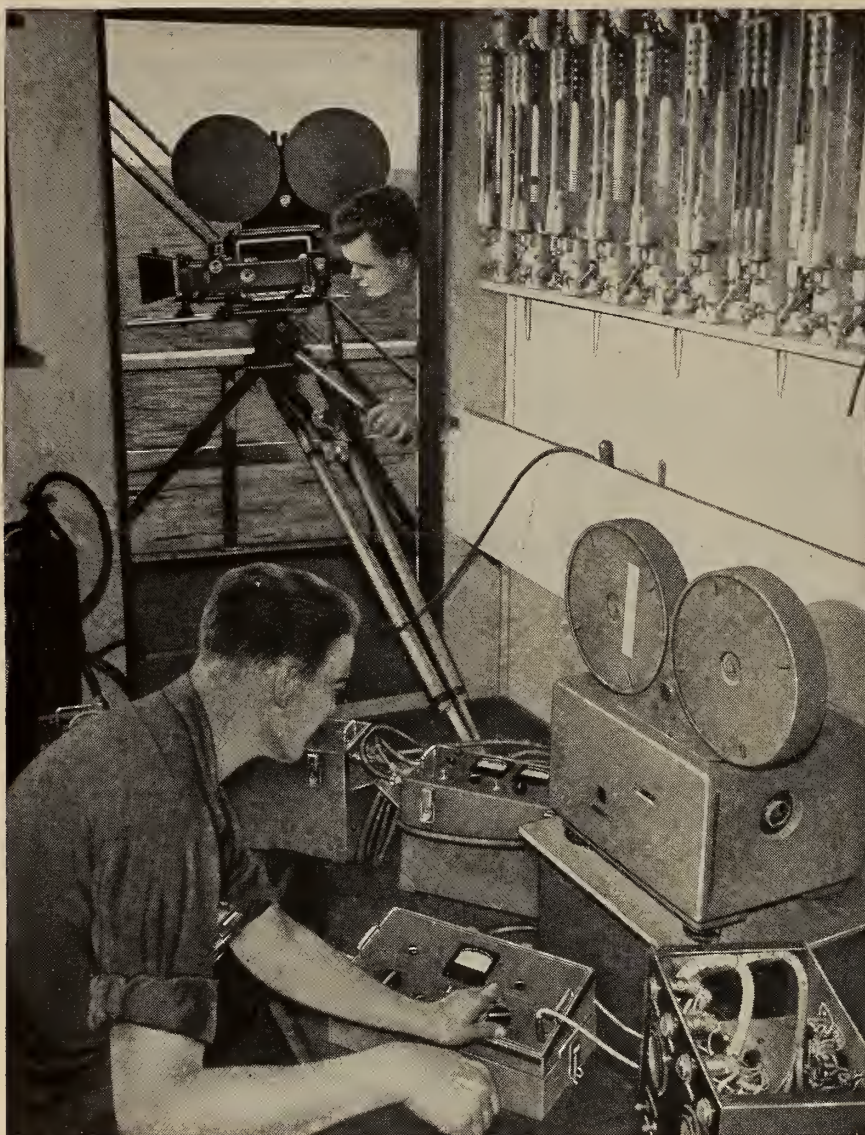
Now, this story seems to us to constitute the erection of a straw man solely for the purpose of knocking him down, because it is "preposterous" to imagine experienced hands such as those comprising the TOA-SMPE committee approaching the FCC on any such basis. It would seem, also, that somebody with a deep interest in transmission by coaxial cable helped mightily in creating the mood for the story.

There is a well-defined path for the TOA-SMPE group to tread in approaching the FCC, a path, let it be said emphatically, that augurs well for ultimate success. The first step would be to request an *experimental* license for a service which is considered to be useful, technically feasible, and in the public interest. Such a license would undoubtedly be granted.

Three months later the FCC could be approached again for an extension of the license on the basis that preliminary tests had proven very encouraging but that more time was required to improve the system. This request, too, likely would be granted. Six months later, on the basis of intensive tests and accumulated experience, the FCC could be petitioned to hold a public hearing at which testimony from all interested parties, pro and con, and engineering data could be aired. Following such a hearing, and in the likely absence of any serious opposition, application could be made for, say, 12 channels; and the motion picture people would probably wind up with three channels.

Thus the procedure, one which is held by experienced people to hold out great promise for the motion picture field. Meetings of the TOA and SMPE are held regularly, and it is reported that sufficient progress has been made to render likely an early request of the FCC for an experimental license.

The theatre field is laboring under the dual handicap of a very late start in the Tv field and the inevitable division of opinion and interest among exhibitors. The task ahead is tough enough without having to saddle the added burden created by such uninformed stories of the kind mentioned above.



Western Electric "300" recording system in use aboard Navy Electronics Laboratory vessel at sea. (Official photograph U. S. Navy)

## *How the Navy uses Western Electric recording equipment*

U. S. Navy scientists use Western Electric sound film recording equipment to make on-the-spot records of the operation of sonar, radar, fire control and other naval electronic equipment. These sound motion pictures provide a permanent record for laboratory study whenever and wherever needed.

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## Elementary Laws of Electron-Optics

THE thorough study of light and optics entails quite some mathematical work even for the student who is well-versed in such matters; for the layman, conversant with abbreviated formulae, a certain degree of interest may exist. But the majority of people regard involved formulae as very dry and a necessary evil; while still another group of the uninitiated regard math as a lot of undecipherable hieroglyphics.

If the appended observations err, they do so on the score of simplicity, with the mathematical angles being completely ignored.

### The Cathode-Ray Tube

Most engineers and projectionists are familiar with cathode-ray tubes, since so many were used during wartime in all the services, and today they are commonplace in the electronic art. The term "cathode-ray tube" is not quite apt, for since the basic principle depends upon an "electron beam" or "electron jet," possibly a more suitable name would be "electron tube."

In its simplest form, a cathode-ray tube consists of an evacuated glass bulb—or one containing an inert gas—and three electrodes: (a) filament (cathode); (b) anode, and (c) cylinder. Nor-

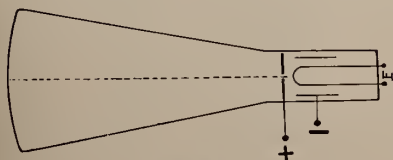


FIGURE 1

*Some notes regarding electrons in motion, and a comparison of their behavior with that of light.*

By A. BUCKLEY

mally, the filament is heated by a two-volt supply, a positive potential is applied to the anode, and a negative bias is applied to the cylinder.

Figure 1 illustrates in schematic form the general idea. Electrons emitted by the cathode are attracted by the concentric anode, and, due to the repulsion exerted by the negative-biased cylinder, they are concentrated into a "pencil" or beam.

Often in a "hard" tube (*i.e.*, one highly evacuated) additional anodes are used to bring the electron beam to a focus on the fluorescent screen at the end of the tube. In such a tube the pencil of rays is quite invisible until it reaches the chemical screen (which in a primitive tube may consist of zinc sulphide) when, due to the bombardment by high-velocity electrons, visible light is produced.

### The Rectilinear Propagation of Light and Electrons

In the case of a gas-focused tube, the electron beam can often be seen, for the electrons moving with high velocity hit the gas particles and become luminous. Similarly, in a "soft" power tube the modulations of speech and music can be "seen" in the form of varying degrees of ionization. The result is a bluish glow

which varies constantly in brilliancy.

Normally, electrons moving in the form of a beam from cathode to anode, and beyond, as shown in Fig. 1, proceed in perfectly straight lines, just like light rays. When either electrons or light rays proceed in perfectly straight lines, their behavior is said to be "rectilinear."

Light rays are *reflected* by mirrors and *refracted* by lenses. Electron beams are controlled by either electrostatic or electromagnetic means. Let us discuss several points relative to this means of control which has given rise to the term "electron-optics."

From first principles we know that electrons, being characteristically negative, are attracted by a positively-charged body and repelled by a negatively-charged one; also, the presence of a magnetic state causes the bending (or changing of the shape) of an electron beam. Figs. 2, 3, and 4 show just how simple deflection occurs.

When light passes through a block of glass at exactly 90 degrees, its course is not altered (Fig. 5). Similarly, when a pencil beam of electrons passes between

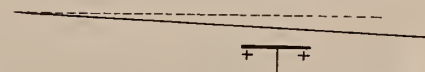


FIGURE 2

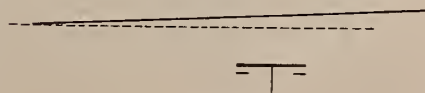


FIGURE 3

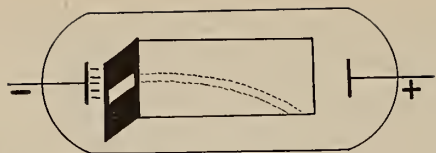


FIGURE 4

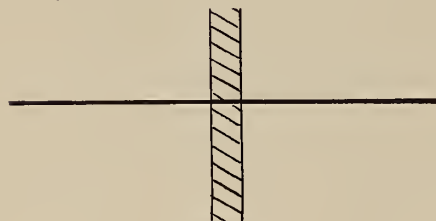


FIGURE 5

two *uncharged* plates, its course is unchanged (Fig. 6). If, however, a beam of light enters a block of glass at any angle up to a critical limit, its direction will be bent toward the normal\*, or perpendicular, as it passes through the denser medium. Upon emerging it will again take up a similar but displaced course (Fig. 7).

#### Change in Velocity Effect

Similarly, an electron beam entering a region such as is shown in Fig. 8, consisting of two fine-wire meshes at different potentials, will be bent toward the normal. The degree of electronic refraction will depend upon the intensities of the charges on the wire meshes, the dimensions of the mesh, and the closeness of the mesh. Likewise, the degree of light refraction is dependent upon the substance through which the beam passes.

\* An imaginary line at right angles to the surface.

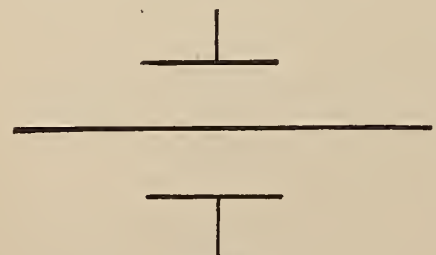


FIGURE 6

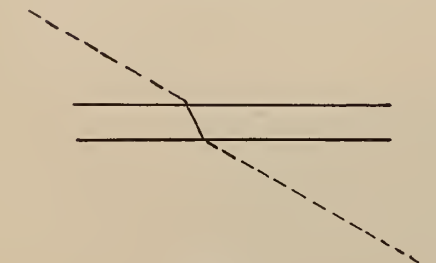


FIGURE 7

While in some instances almost exact similarities exist between light and electron-optics, in other cases the behavior of the two exhibits a direct contrast. The general ideas are the same in connection with reflection, refraction and deviation, but in detail there are certain differences. For instance, when light passes from air to glass the change is abrupt; whereas in the case of electron movement the strength of the electrostatic or magnetic field is gradual.

Of special interest is that the speed of light is *reduced* when passing through a denser medium (i.e., when light passes from air to glass, it passes from a rarer to a denser medium); but in the case of electrons in motion, the velocity is *increased* within the refracting space.

The comparison between the performance of a simple double-convex lens and its electrostatic counterpart is indeed of

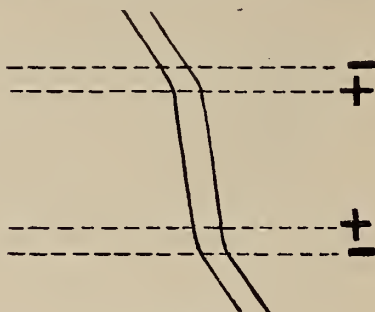


FIGURE 8

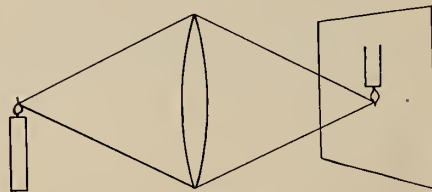


FIGURE 9

interest. Fig. 9 shows the usual candle and paths of the light rays through the lens, and the resultant image on the screen. The investigations into the electronic counterpart of this and other examples are due to Knoll and Ruska who constructed an electrostatic lens as shown sectionally in Fig. 10. This sketch shows how the curved surfaces of the bi-convex lens were replaced by two shaped fine-wire meshes at different potentials.

#### Rays of Parallel Origin

Parallel rays proceeding from a parabolic mirror or from a light source at a great distance (such as from the sun) may be brought to a focus by a double-convex lens as shown in Fig. 11. Similarly, in a cathode-ray tube the electrons are emitted at right angles from a relatively large source; therefore, this movement can be said to be parallel to the axis of the tube (Fig. 12). This parallel

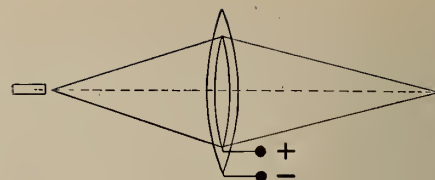


FIGURE 10

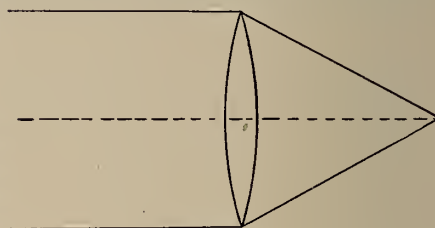


FIGURE 11

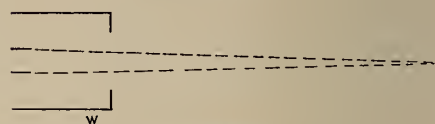


FIGURE 12

beam can be focused by means of a Wehnelt cylinder (W).

Another law of optics relative to the reflection of light also has its counterpart in electron optics. A source of light can be seen apparently behind the mirror at a distance equal to the distance of the source from the mirror, as shown in Fig. 13. In like fashion, by using fine-wire meshes an exact counterpart can be produced in connection with an electron beam. The angles of incidence and reflection obey the same laws as in light optics (Fig. 14).

#### Deviation by Electrostatic Prism

When a beam of light enters a plate of glass with polished, parallel sides, the angles of entrance and exit will be equal, although displaced in certain instances. If the sides of the glass be not parallel, then the light beam will be bent as

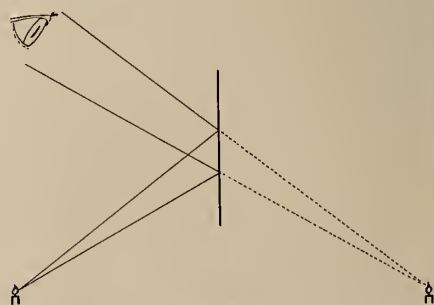


FIGURE 13

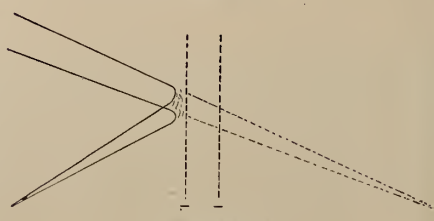


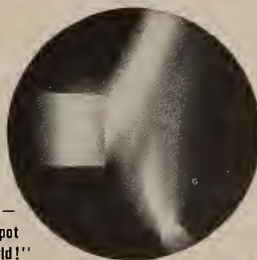
FIGURE 14

"National" high intensity  
carbons change  
dim screen  
**SQUINT**



to bright screen  
**SPARKLE**

and make box office  
**BOOM!**



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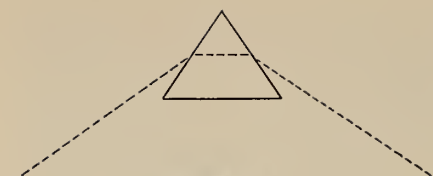


FIGURE 15

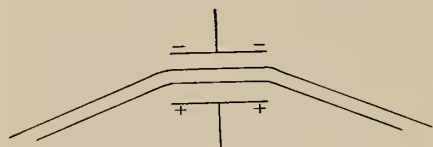


FIGURE 16

shown in Fig. 15. This block of glass is called a "prism."

In electron optics the same thing may be accomplished by using two control plates at different potentials. As in all other cases of electron lenses, the amount of deviation will depend upon the magnitude of the charges, the separation of the plates, and their position relative to the electron beam. Fig. 16 is a simple exposition of how this occurs.

Figure 17 shows how in an optical combination two lenses—one of crown, the other of flint glass—are used in contact to minimize aberration or distortion. The electron-optical equivalent of such a scheme is seen in Fig. 18, together with the resultant field. The bending of the electron beam and its focusing will be noted, thus the analogies are again very similar.

### Wire Mesh Screen Deficiency

Although, as we have seen, the experimental use of wire mesh screens is the nearest approach to the glass lenses and mirrors used in connection with light, they are not used in cathode-ray tubes. The distortion produced by these mesh screens is considerable, therefore in early cathode-ray tubes the elements consisted of sheet metal tubes, concentric and flat plates. In the modern tubes magnetic focusing and deflection are used more often.

For practical explanations and comparisons the laws of light-optics and electron-optics are very similar; but the refracting, reflecting and deviating media are totally different in these two branches of physics. Lenses, mirrors and prisms have fixed dimensions and constant prop-

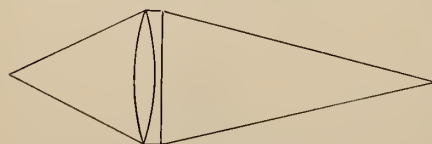


FIGURE 17



FIGURE 18

erties; but electron-optical "lenses" and other devices are changeable in strength and effects.

In light-optics the correction of spherical aberration or distortion may be accomplished by using two kinds of glass in a composite lens; in electron-optics such distortion is usually corrected experimentally by changing the intensity or direction of the controlling field. A

further point is that the possibilities of interaction between the focusing and modulating electrodes sometimes exist.

Although the subject matter of this article is by no means new, it is felt that this simplified exposition of a difficult subject will be of interest to those who may someday handle that modern miracle of the electronic art—television.



*To the Editor of IP:*

I have found brand-new Warner Brothers prints considerably more brittle than those of most other distributors. Since the film stock is the same (Eastman) it seems to me that this brittleness must be due to some WB variation in processing or treatment.

I do not mean that WB prints are likely to break in projection—far from it. The brittleness consists of the inability of the film to be sharply creased without breaking. Paramount prints, on the other hand, may be creased and "unbent" without severance of the print. No, I don't run prints that have been creased: I cut out the creased part and splice. My interest lies in the direction of a rather fine point of processing technique.

STATE OF MAINE PROJECTIONIST

[Warners uses exactly the same Eastman system of edge-waxing as is employed by Metro and other major distributors. No Warner print is waxed over the entire film surface. No complaints anent brittleness or any other deficiency has been received by the Warner lab through normal channels.

There is always to be considered, of course, the matter of climatic conditions. In Maine, for example, the atmosphere is not only cold but dry, and this might conceivably contribute to the "brittleness" referred to by this correspondent—although this does not explain why the reference is confined to Warner prints.—Ed.]

*To the Editor of IP:*

Quite a few years back a group of practical projection people got together and did a splendid piece of work by establishing the Standard Release Print. This was a wonderful example of co-operative effort among several branches of the industry which neither before nor since have jointly supported such projects.

All this worthy effort, however, is being negated by the increasing practice of using film leaders to make density tests and leaving blank spaces in the rundown and other similar variations in the leaders of reels.

These blank spaces in leaders make it very tough for the projectionist to frame properly when threading up.

Upon inspecting a show prior to its initial run the writer has to check each and every reel and either use the edge-markings or actually measure the blank inserts in order to frame correctly. Moreover, these blanks almost invariably have one or two patches in them, thus making them unreliable for framing. Even without patches, I know of nobody who can frame on a blank.

It would seem to me that this is a job for the Projection Committee of the SMPPE, there being no other agency through which positive corrective action may be taken.

KEN CALDWELL  
IA Local 233, Buffalo, N. Y.

[This is by no means the only departure from SRP standards but it is certainly one of the more flagrant examples. Corrective action would be aided by supplying the title of the feature and its distributor.—Ed.]

*To the Editor of IP:*

My recent articles covering the new British projection gear seem to have caused quite a lot of comment. Therefore, let me say here and now that in my unbiased opinion there is little amiss with either American or British projection gear. All new machines, whatever their origin, are subject to teething troubles, and neither American nor British machines are exempt from their little worries at first.

The question of preference for one machine or the other depends on one's outlook, just as if one is buying a car or a typewriter. Basically, picture projection was as good 15 years ago as it is today. The weakest link in any motion picture outfit still is the human element. Skilled hands can usually get more out of old, obsolete equipment than unskilled ones can get out of the new.

H. HILL, British Observer for IP

### God (and Science) Save the King

If you were a projectionist in Siam, you would be required by law to close each program with a screen projection of the likeness of the King the while you played a recording of the Siamese national anthem.

# Tv Film Projectors

By G. W. TUNNELL

Engineering Products Section  
Radio Corporation of America



FIG. 1. Simplest arrangement of RCA 16-mm Tv projector (left) and film camera (right). The image is projected through the rectangular opening in the camera onto the face of an Iconoscope tube.

**T**ELEVISION (Tv) film projectors are fundamentally similar to standard 16-mm and to 35-mm theatre-type motion picture projectors. The principal difference is that the Tv projector must synchronize with the Tv system. In the RCA 16-mm Tv projector this is assured by the fact that both the Tv synchronizing generator (which drives the beam in the camera pickup tube) and the motor (which drives the projector) have a common source of power in the 60-cycle power line.

To insure that the shutter will be "in step" at all times, a large-size motor with a separately-excited d-c field is used. The d-c field, being polarized, makes the motor always "look" in proper phase

relationship with the synchronizing generator.

In the Tv system, the projector projects the image onto the face (mosaic) of an Iconoscope pickup tube which is located in the film camera. Fig. 1 represents a typical arrangement of the projector and the film camera.

## Iconoscope Film Pickup

Let us consider the Iconoscope in the film camera as the electronic eye which rapidly scans the projected image and thus transforms the picture information received from the film projector into the proper electronic signals for Tv transmission purposes.

In order to obtain complete picture information it is necessary that this electronic eye open and close at a uniform rate of speed. A speed of 60 times per second has been chosen for Tv because it may easily be referenced to the power-line frequency which is standardized nationally.\*

\* With a few exceptions.

FIG. 2. Showing the time relationship of the framing light and the scanning sequences employed in the RCA 16-mm Tv projector (Type TP-16B). Line A shows the pull-down interval in a standard 16-mm projector, which is about 1/6 of the total frame cycle. Line B shows the effect of speeding up the pull-down, which is now only 1/8 the total frame cycle.

Line C indicates the duration and repetition rate of the

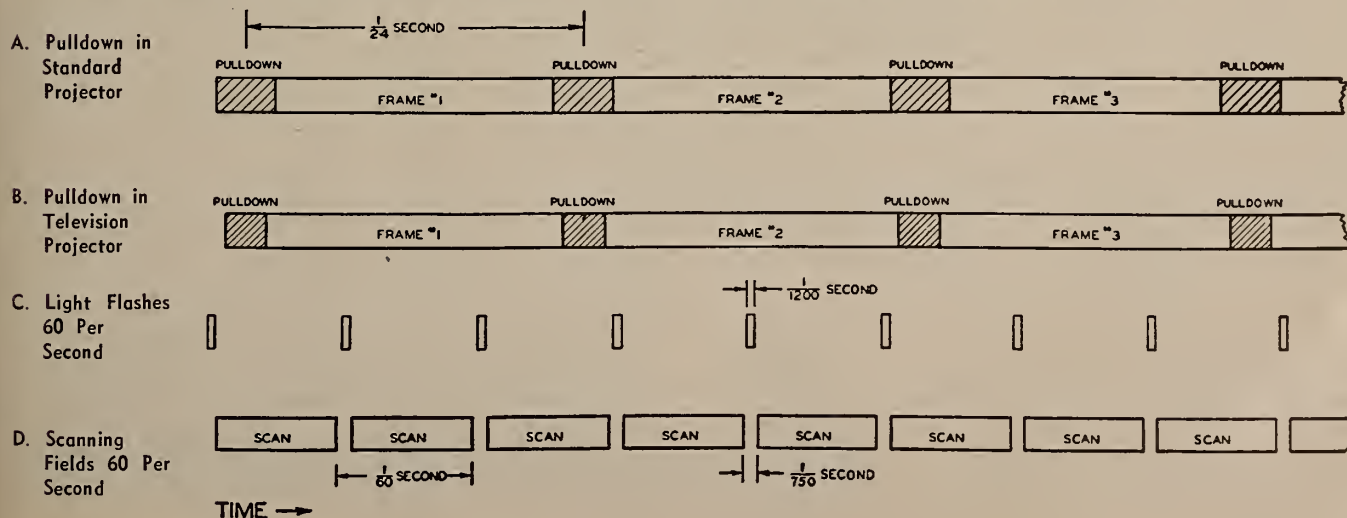


FIG. 3. Closeup of shutter and takeup mechanism. The sound preamplifier is located below. Projector covers removed for this shot.

This process is called "scanning" and is accomplished by causing the electron beam to travel across the image on the mosaic in a series of horizontal lines. Two scanings or fields (1/60 second duration each) are required to make a complete Tv frame (1/30 second duration) due to a process called "interlacing" (alternate line scanning). It may be seen, therefore, that 30 complete frames are scanned each second.

If motion picture practice utilized a 30-frame-per-second rate of exposure, then a single Tv frame would correspond exactly to a frame of motion picture

short intervals during which light is allowed to fall upon the film. Note that Frame 1 is illuminated twice, Frame 2 three times, and so on. Line D shows the scanning intervals. Note that scanning is accomplished during the unlighted interval following each period of illumination. This is made possible by the "storage" or "memory" property of the Iconoscope, the tube which has been greatly improved since its introduction.

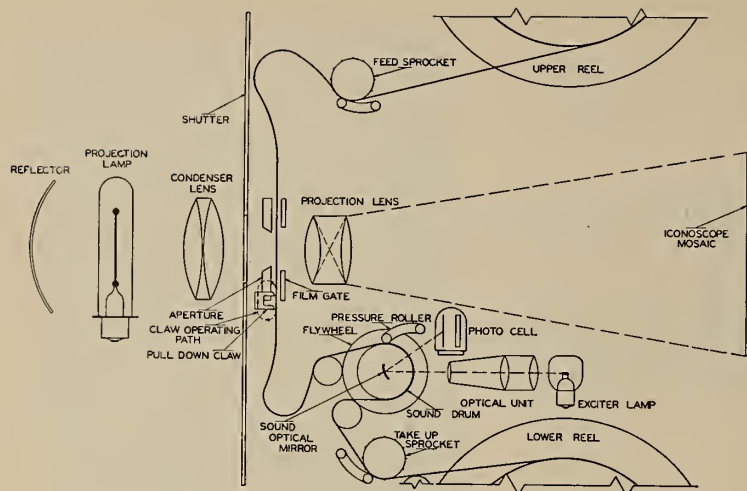


FIG. 4.  
Diagrammatic representation of the optical system and film-feed arrangement of the RCA 16-mm Tv projector.

film. Since motion picture technique has already established a 24-frame rate, it was necessary to develop a method of using the 24-frame projector with the 30-frame Tv system.

### Alternate Scanning Frequency

In the RCA 16-mm projector this method is often referred to as 2-3-2-3 scanning. This method permits the film camera to scan the first film frame *twice*, the second *three times*, the third *twice*, the fourth *three times*, etc.

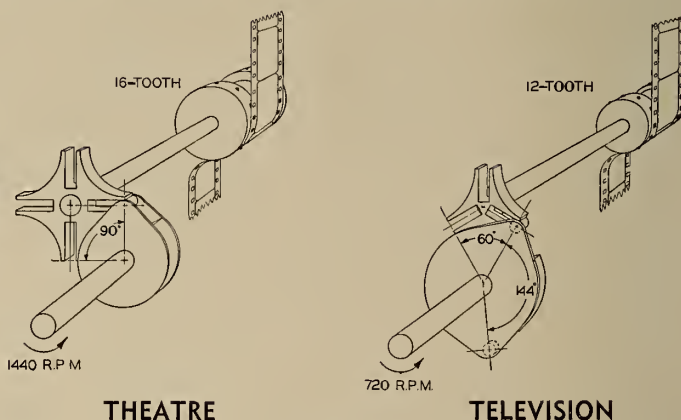
The average rate, then, is  $2\frac{1}{2}$  scanings per film frame, which, when multiplied by 24 film frames per second, provides 60 scanned fields per second, which, when interlaced, is 30 Tv frames per second. Thus is accomplished the use of a 24-frame projector with a 30-frame Tv system.

Figure 2 reveals how this type of scanning is accomplished. Line D shows a standard Tv film camera cycle. *Two* successive scans of  $1/60$  second duration

are required to make *one* complete Tv frame, which, of course, results in the 30-frame rate mentioned previously.

The spaces shown between the scanning fields are known as "blanking

FIG. 5. Graphical comparison between standard theatre and Tv 35-mm intermittent movements.



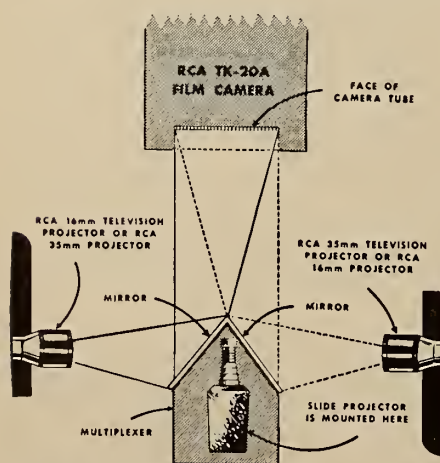
periods." It is during this blanking period that bursts of light containing picture information are transmitted from

the projector through the film to the film camera. The Iconoscope used in the film camera has a storage-of-memory characteristic which permits it to retain the information received from the light burst for a period long enough to scan one field. The source of light is a 1000-watt, 115-volt lamp.

The duration of these light bursts is controlled by the size of the opening in the rotating shutter (Fig. 3). It is now evident that these bursts of light will deposit intelligent picture information on the mosaic of the Iconoscope only if the motion picture film is stationary in the aperture.

### Shortened Pull-Down Period

If pull-down periods of standard duration were used as in Line A (Fig. 2), the light bursts would transmit information appearing in the aperture during the pull-down period. In view of this,



**RCA Multiplexer**—For uninterrupted projection of multireel films where two projectors are needed. This ingenious device eliminates the need for an additional film camera. It consists of a V-shaped mirror for reflecting images from either projector to film camera, and a slide film projector for inserting station breaks, commercials, etc.

FIGURE 6

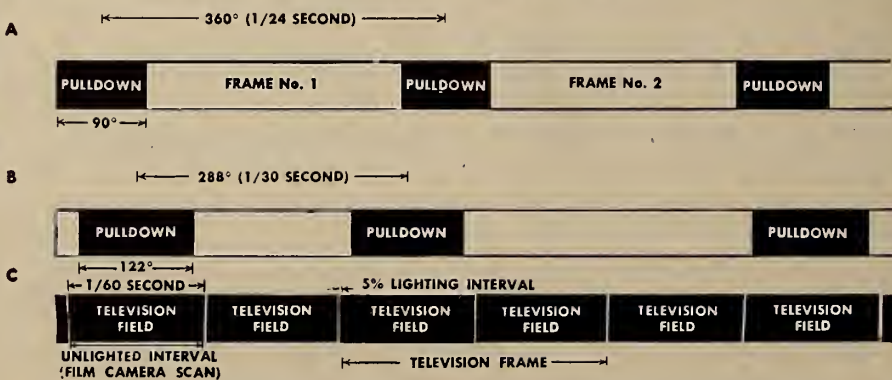
**How it Works**—Line A shows the pull-down timing of a standard 35-mm film projector (no lighting during  $90^\circ$  pull-down). Line B shows pull-down timing of the RCA 35-mm television projector—and the duration and repetition rate of the short intervals during which light passes through the film.

Line C shows the projector lighting interval of the 35-mm television projector. The "light-on" intervals are produced by a pulse-controlled camera lamp that produces an

it is necessary to shorten the pull-down period to the point where it will not disturb the transmission of the picture

800-microsecond flash every  $1/60$ th second. The picture images are projected onto the film camera pick-up tube during the retrace (blanking) interval of its scanning beam. The "storage" property of the tube permits scanning during the unlighted interval between flashes.

Scanning releases the picture charge—converts it into a video signal. A synchronizing generator keeps the projector and film camera in phase.



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*When the lamps are **STRONG** the picture is bright!*

information. Pull-down periods of the duration shown in Line B, Fig. 2, are those used in the RCA 16-mm Tv projector.

The shorter pull-down period must be provided without destroying the average film speed of 24 frames per second through the projector, inasmuch as sound reproduction must continue at a 24-frame rate. RCA has chosen elliptical gears for use in the pull-down mechanism. These gears increase the pull-down speed by about 50% as compared with a standard projector. However, the 24-frame rate through the sound optical system still is maintained.

The discussion up to this point has centered around the 16-mm projector; however, a few facts anent the RCA 35-mm Tv projector should prove helpful. The principal constructional differences between the two projectors are: (1) the action of the intermittent, and (2) the type of light source utilized.

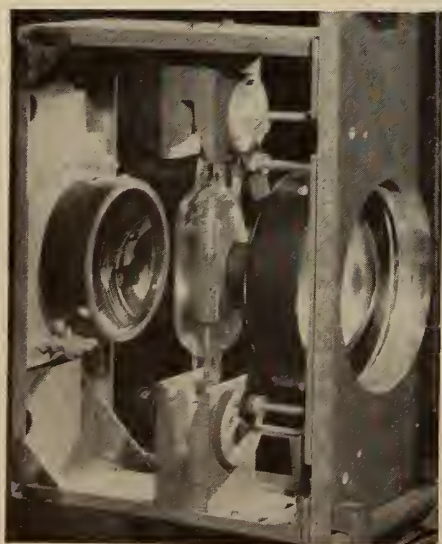
### 35-mm Tv Projector Intermittent

The intermittent mechanism in the 35-mm Tv projector is a special Geneva movement. A comparison of this movement with one of conventional design is shown in Fig. 5. The Tv intermittent is designed to allow the film to remain stationary in the aperture for a longer period of time for alternate film frames.

Figure 6 shows a standard 35-mm intermittent cycle (Line A) and a Tv 35-mm intermittent cycle (Line B) compared with the requirements of the film camera (Line C). It can be seen that the Tv intermittent causes pull-down to occur at positions which will not affect the light flashes which transmit picture information to the film camera.

The light flashes occur at the same rate as those in the 16-mm Tv projector, however, they are created by a flashing

FIG. 7. Closeup of the 35-mm projector head showing lamphouse with gap lamp in place.

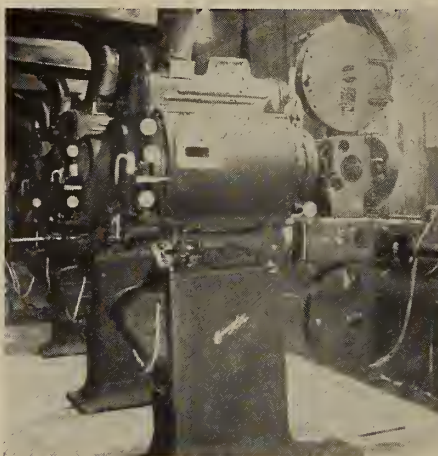


Herewith the verbatim publication, including the title, of a contributoin from an IP subscriber for many years (and, incidentally, a Simplex distributor) whose progressive social ideas obviously are not affected either by his remote location or his intriguing name.

## The Man in the Tropical 'Box'

By RUN RUN SHAW

Shaw Enterprise, Singapore, Straits Settlements



NO TENT SHOWS, THESE TYPICAL PROJECTION ROOMS IN THE STRAITS SETTLEMENTS Capitol Theatre, Singapore (left): Simplex E-7 projectors and sound equipment, Peerless lamps, Brenkert effect projector, Rect-O-Lite rectifiers. The largest in Singapore, this theatre was opened in 1929. Note "surface wiring." The Rex Cinema, Singapore (right): Super Simplex projectors, RCA sound, Peerless lamps, and tungar rectifiers.

**P**PROMPTLY at 11 o'clock every morning the fire shutter is flicked back, the beam is released, and once again a team of crack projectionists is off on the first lap of its regular daily routine—a routine which will run through five complete programmes and will cover more than a full round of the clock.

This particular scene is set in the projection room of The Capitol, Shaw Brothers' palatial 1700-seater cinema in the heart of tropical Singapore. Projectionists accustomed to working in more temperate climates will doubtless view with concern the thought of 13 or more hours work for man and machine under exacting equatorial conditions—but this is a cinema with a difference, backed by an organization that is progressive almost to the point of being futuristic.

The machinery is the most modern that the industry can provide, and the condi-

gas lamp instead of a shutter. This gas lamp is caused to flash 60 times per second by a special power source known as the "pulsed light power supply." Light rays from this type of system have very little heating effect on the film; in fact, this so-called "cold light" in the aperture permits stopping the film and projecting single frames without the slightest danger to the film.

A cabinet rack houses two of these power supplies as well as a monitor and two switching panels.

tions under which the staff works will be the envy of projectionists the world over. The "Box" stretches for 60-ft. across the entire span of the theatre, and with a width of 14-ft. and an average ceiling height of 20-ft., it must rank among the most spacious of projection rooms. The "Box" is air-conditioned by means of large vector exhaust fans.

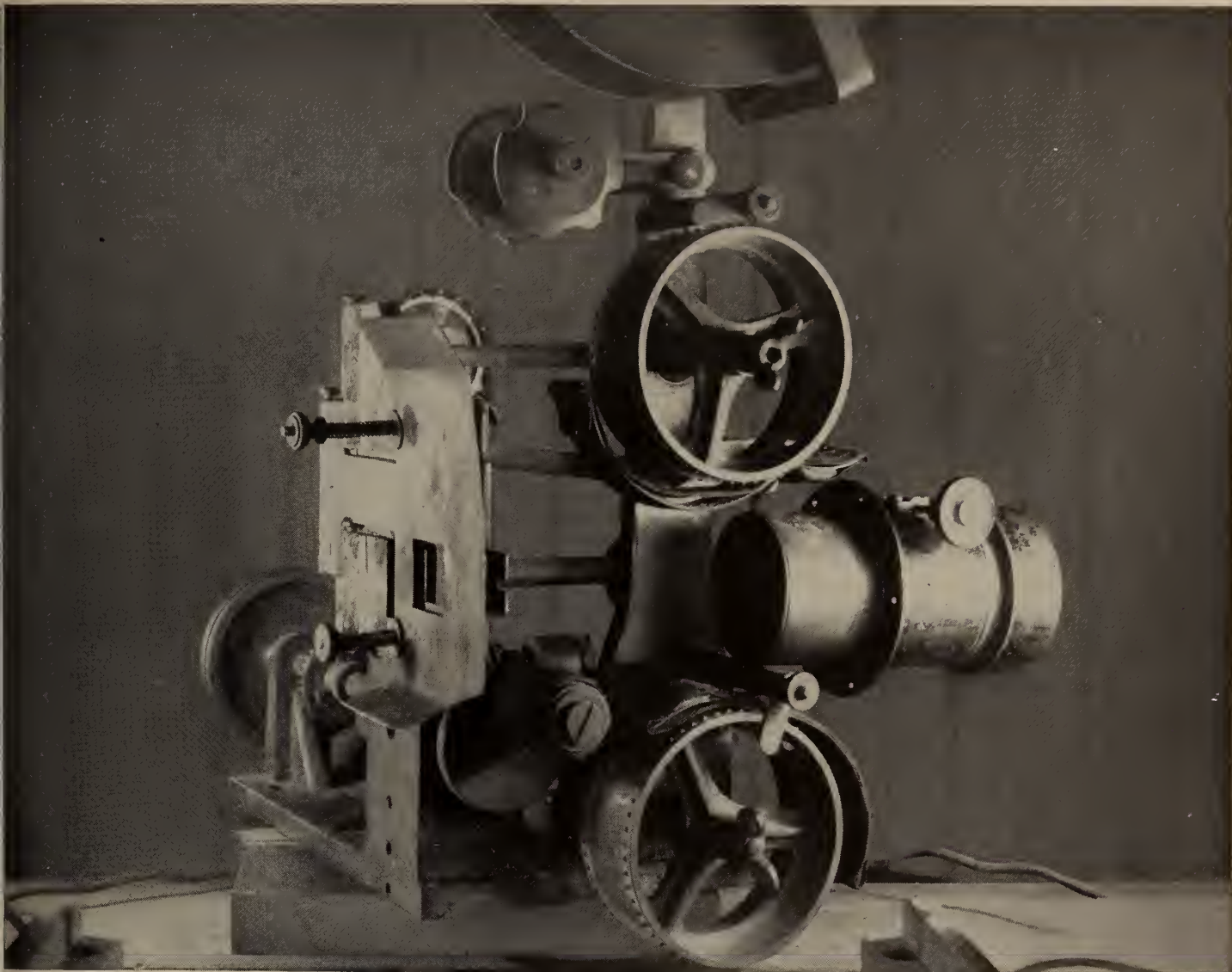
There are no continuous showings in Malaya, and the "Capitol" has a staff of four projectionists to carry through its five complete programmes each day. Their tour of duty is amicably arranged by the senior projectionists in order to provide adequate coverage for each showing and reasonable off-duty time for the men.

### Craft Welfare Prime Concern

Staff welfare has always played a large part in maintaining harmony and goodwill in the Shaw Brothers organization—long-term employees predominate—and the projectionists enjoy all the benefits of a comprehensive welfare scheme. Probably the most important feature of the scheme is the provision of free medical attention, and in a country where medical services are of necessity expensive, it is much appreciated by those eligible to use it.

Employees of the firm are also the recipients of a handsome yearly bonus—

(Continued on page 30)



The Armat Vitascope which projected the first theater movie, April 23, 1896.

## With this, the "unseen showman" got his epoch-making start . . .

**T**HE projectionist has come a long, long way . . . since the 1890's when he put on his show with equipment such as this.

And today, as then, much of a motion picture's success depends upon the unseen showman in his booth.

To his sure sense of split-second timing . . . to his alert control of sound . . . to his deft

handling of elaborate equipment . . . the film illusion owes much of its dramatic, realistic presentation on the screen.

Helping the projectionist to keep the mechanics of the medium from intruding is the top quality of Eastman motion picture films (both sight and sound) . . . members of a famous family started more than fifty years ago.

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# Psychological Elements

*An ardent protagonist of rounded screen corners cites the reasons for his attitude, despite the almost universal preference for square corners.*

## in Projection

By ROBERT A. MITCHELL

THE requirements of motion picture screens as such are understood sufficiently well to permit recommendations which insure satisfactory projection results under a diversity of auditorium conditions. Unfortunately, the same cannot be said of the psychological factors which surround the screen and influence its effectiveness. The obscurity of the subject has, in fact, caused many people to disparage the psychological aspect of projection and regard the process as a strictly mechanical reproducing medium for sight and sound.

This erroneous point of view tacitly denies that the exhibition field has anything to do with motion pictures as a medium of dramatic expression.

Observation and experience give rise to very different opinions. The universal popularity of theatrical motion pictures is due almost wholly to their remarkable power to play upon the emotions, and that the average patron expects an *emotional experience*, not a mere succession of animated views. We are therefore enabled to sense the existence of projection factors of a psychological nature, even though we have no means of weighing or measuring them.

### Sense of Reality Imperative

The secret of the motion picture is to be found in the mysterious realm of the extrasensory. We are required to recognize the potency of intangible emotional forces, if dramatic films are to be successfully created and presented.

The screen is, accordingly, much more than a flat surface upon which pictorial elements appear. It is even more than a window through which magically lifelike scenes are viewed. The screen is, in fact, a portal through which the audi-

ence is drawn into a make-believe world of fascinating illusion where events and situations, however exaggerated and fantastic, *seem to be real*.

If we deny this, if we maintain that a motion picture is, after all, nothing but a picture and that the screen should mirror events in coldly accurate tones because no glamorizing medium places rose-colored glasses before our eyes in real life, then we should not complain when the public tires of the movies.

The projectionist's function in the scheme of things cinematic is vastly more complex than most people realize. He is a creator of "living dreams". The technique of motion picture presentation is just as much a part of the projection art as oiling a projector or splicing a film. The projectionist is a technician, to be sure, but he is also a showman, an artist. All his mechanical, optical, and electrical skills are directed toward the production of intangible dramatic effects.

### Psychological Effect of Masking

Now, it is impossible for the theatre patron to obtain an emotional experience from the screen unless the dramatic quality of the picture and the technique of presentation are such that he readily loses himself in the emotional currents of the film. This means that *all* factors which distract attention from the thematic atmosphere of the picture must be eliminated as far as possible, and that the *framing* of the picture must be such that attention is naturally drawn away from the edges of the screen image to the center, where the concentration of mood and significant action is greatest.

The first matter to be considered in any intensive effort to improve projection effectiveness from the psychological viewpoint is the problem of screen masking. It is assumed here that the screen surface, itself, is satisfactory, and that the projection itself is good.

There are several methods of masking screens. Obviously, one of these methods is correct, and all the others are wrong.

The prevalent practice of masking screens with *square* corners is open to considerable criticism. It violates a paramount prerequisite of satisfactory screen-image framing because the sharp corners have a strong tendency to distract attention (not necessarily direct vision) from the central areas of the screen. The corners thus act as reminders to the patron that he is observing a picture on a flat surface of limited area, and this effect obtains even when the observer is not consciously aware of it.

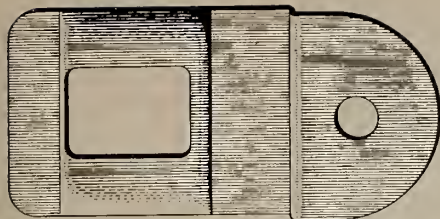
Frequently the result of subconscious distraction is a vague restlessness and a disturbing wandering of the thoughts, especially during long scenes having more dialog than action. In the course of time the dissatisfied patron, associating motion pictures with discomfort and boredom, will seek more diverting forms of entertainment.

Sharp corners have the same distracting effect as the zig-zag line used as the conventional symbol of electricity. *Rounded* screen-image corners, on the other hand, free the boundaries of the picture from *all* attention-arresting points. By the use of rounded corners vision passes naturally to the central portions of the picture *and stays there*.

Whether or not a round-cornered screen "looks better" than a square-cornered one is a moot point. The ap-

FIG. 1. Comparison of square- and round-cornered screens of the same dimensions. Rounded corners are advocated in the belief that square screen corners are points of distraction which psychologically compete with the projected picture for the attention of the audience.





Standard Projector Aperture  
Dimensions: 0.825 x 0.600"  
Corners: 0.047" radius

FIG. 2. Standard round-corner aperture plate of the slip-in type.

pearance of a blank screen hardly matters, for the public seldom sees a theatre screen "white". The important thing is that a round-cornered screen image greatly facilitates the patron's absorption into the drama of the picture.

When the patron "loses himself" in a picture, the boundaries of the image virtually vanish from conscious perception. This is true of any screen, regardless of the type of masking used. Psychologically speaking, the picture becomes *indefinitely bounded*. Round-cornered screens establish this desirable effect with remarkable rapidity and succeed in maintaining it satisfactorily throughout a two-hour show.

#### Picture-Boundary 'Indefinition'

The phenomenon of picture-boundary "indefinition" is worth considerable thought because it has been objected that a round-cornered screen appears to restrict overall area. This may be true when blank screens are viewed, or when a round-cornered picture is observed momentarily through a projection-room port. The effect is admittedly variable and slight.

The writer fails to see that it has an adverse, if any, effect upon the patron. The effect of a round-cornered screen image is such that the picture appears neither larger nor smaller than a square-cornered picture of the same area. Paradoxically, it may not appear to be the same size, either, for an enhanced boundary indefinition blurs or dulls the consciousness of definite picture area in the mind of the engrossed patron.

The well-known preference of moviegoers for seats not too close to the screen is convincing proof that physical hugeness is undesirable.

Figure 1, sketched from the projec-

tion room of a theatre, shows a screen, the same size in both instances, before and after conversion to round-cornered masking. When one's gaze is directed steadily at the center of each of these screens for a minute or two, it can be seen that square corners impress themselves sharply even upon averted vision; while rounded corners tend to "melt" the boundaries of the rectangle.

Corners having larger curves would demonstrate this effect more readily, but artistic considerations fix the radius of the corner curves at 1/16 the width of the screen.

The actual projection of pictures indicates that the round-cornered screen makes the flatness of a two-dimensional picture less obvious. Not that this type of screen masking produces anything like a three-dimensional, or stereoscopic, effect, but it confuses the screen distance in a darkened theatre in such a way that the observer is helped to overlook the inherent flatness and fixed distance of the projected scenes.

#### Effect on Image Steadiness

Another noteworthy effect of round-cornered screen images is an apparent reduction of image unsteadiness. Every now and then a defective print comes our way.<sup>1</sup> The picture sways and jumps because the camera was poorly supported or because something went wrong with the printing process. In such instances any "trick" which tends to minimize the defect, even if by optical illusion, is too valuable to pass up.

Many theatre men make the mistake of considering round-cornered screen images passé. Historically, round-cornered projector apertures were universally employed until square-cornered screen masking attained its present position of favor only because of the ease of setting it up. A few exhibitors, keenly aware of the significance of many seemingly small details, still cling bravely to the time-tried round-cornered picture; but most managements slavishly conform to an artless "modern" practice.

Round-cornered apertures still are standard in motion picture cameras. Fig. 2 shows a round-cornered projector aperture of the familiar slip-in type, which is

<sup>1</sup> See "Factors Affecting Image Steadiness" in IP for January, 1948, p. 5, for comprehensive trouble-shooting measures.

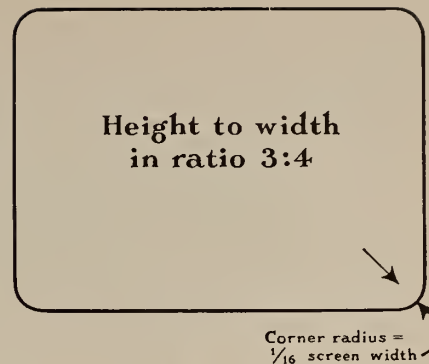


FIG. 3. Proposed standard form of round-cornered screen image.

used in conjunction with round-cornered screen masking.

The psychological importance of the form of the projected picture asserted itself strongly during the period of conversion from silent to sound pictures. The frames on 35-mm. silent film had a height-to-width ratio of approximately 3:4. The addition of the sound track altered the proportions of the frame and resulted in a picture almost square in form.

The psychological effect was so bad that technologists restored the old 3:4 silent picture ratio by diminishing the height of the frame. It is difficult to explain why nothing but a 3:4-proportional screen image can be used successfully in a motion picture theatre, but it is absolutely true.

The same could be said concerning rounded corners, for they provide the most satisfactory framing for scenes of all types. Fig. 3 illustrates the form of what the writer holds is the correctly masked screen. The height and width are in the 3:4 ratio, and the radius of the rounded corners is 1/16 the width of the screen.

Despite the almost universal use of square-cornered rectangles for screen images, the popular association of round-cornered quadrilaterals with projected pictures stubbornly persists. Nine out of ten artists who depict the interiors of motion picture theatres delineate the screen images with rounded corners; and what is more, they intuitively adopt the most desirable corner radius! This may be explained as a subconscious preference for that type of screen image, and regarded as a trustworthy sampling of public opinion.

#### Proper Procedure for Masking

The actual task of masking a screen with rounded corners is usually very simple, but it calls for painstaking workmanship. A sloppy masking job is worse than none.

The easiest method of inserting the corners is suggested by Fig. 4. The con-

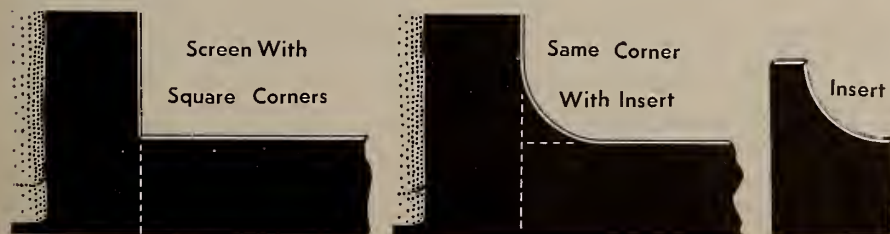


FIG. 4. Suggested method for masking theatre screen with rounded corners.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**T**HE widely-heralded move by John L. Lewis's catch-all District No. 50, United Mine Workers of America, to gain control of theatre employes throughout the country was checked at Philadelphia last month where it collided head-on with the IA. In a collective-bargaining election conducted by the Pennsylvania Labor Relations Board, theatre employes throughout the city (cashiers, doormen, ushers, matrons, cleaners and porters) gave a better than two-to-one confidence vote to IA Local B-100, which had represented them for the past 11 years. The IA victory was a clean sweep among the employes of three theatre circuits and one service contractor. District No. 50 sent a large number of organizers into the Philadelphia drive, while the tightly-knit IA organizing group was headed by Larry Katz, International representative.

In a personal letter to all members of Local B-100, President Walsh promised that the IA would fight for a "fair and adequate wage increase" for the Philadelphia theatre employes, and that an "absolute condition" of any final settlement would make all benefits retroactive to August 3 last.

- Pete Mole, president of the Mole-Richardson Company on the West Coast and

executive vice-president of the SMPE, is on a three-months European tour through England, Switzerland, France, and Italy.

- The first inter-city bowling match held recently between Detroit Local 199 (Nightingale Club) and Cleveland Projectionists Local 160 resulted in a victory for the Nightingales. The William Kramer Trophy, named in memory of William Kramer, member of the Cleveland Local who died shortly after these match games were inaugurated, now holds the place of honor in the office of Roger M. Kennedy, Local 199 business manager.

These inter-city bowling matches were sponsored and promoted by W. Haartge and Floyd H. Akins of Detroit, and R. Sheridan and Tom Fitzgerald of Cleveland. The first block of five games was rolled in Cleveland, with the home team scoring a 54-pin lead. The Detroit team overcame this lead, however, by scoring 458 pins on the return match.

The Cleveland bowlers were J. Sobota, A. Zill, F. Lane, G. Bullock, and T. Smart on Team No. 1; R. Sheridan, E. Fitzgerald, E. Gehringer, W. Nobbe, and T. Fitzgerald, made up Team No. 2. Players for the Nightingale Club were W.

Fouchey, E. Waddell, W. Haartge, J. Colwell, and R. Thompson on Team No. 1; E. Douville, R. Haskin, C. Larsen, M. Haskin, and G. Light played on Team No. 2.

- Otto A. Trampe, 54, member of Milwaukee Local 164 since 1919 and its business manager for the past four and one-half years, died last month after a prolonged illness. During the past 30 years, Trampe served the Local in many official capacities and was well-known throughout the Alliance. He was an active and ardent worker in the labor movement and was held in high esteem by all branches of the film industry.

Large delegations from the Chicago, Racine, Kenosha, and Sheboygan Local Unions attended the funeral services, which were held in the Zion Lutheran Church. He is survived by his widow, a son, Philip (member of Local 164), and two daughters.

- *Jottings from Local 623, West Palm Beach, Fla.:* Johnny Cummings, secretary of the Local, moved into his new home and is spending his leisure time puttering around the place. . . . James Bursey was the delegate to the State AF of L Convention held recently in Lakeland. . . . Charles Crow, business manager, has been appointed delegate to the forthcoming 7th District Convention. . . . C. C. Dodds is the proud-chested father of a son—his first-born. . . . Davey Day, Chicago Local 110, is still hibernating on the sands of West Palm Beach, waiting for the warm breezes to hit the Windy City before departing for points north. . . . The Local's recent annual banquet was voted tops by the members and guests.

- One of the more pleasant happenings during the past month was a telephone chat with P. A. McGuire, whose name looks a bit strange when not bracketed with the famous slogan "Better Projection Pays" which he featured for so many years in his advertising for International Projector Corp. Mac phoned in from his home in Amityville, L. I., where he has been making steady progress in recovering from a physical setback. He is very

## THREE CHARTER MEMBERS OF LOCAL 159, PORTLAND, ORE., STILL ON THE JOB



Forty-one years ago 20 men affixed their signatures to the charter of Local 159. Shown here (left to right) are three of these original signers who still work daily at the craft: Arthur Phillips, Homer Haynes and George Grischow. Gold life membership cards in Local 159 were presented these three veterans by President L. R. Smith, extreme right.

appreciative of the many messages reaching him from his host of friends in the craft.

Although Mac has been enjoying a television set for many weeks now, he insists that Tv has a long road to go before it can compete with the entertainment value offered by the motion picture theatre. More than ever before, says Mac, projectionists must be on their toes to keep their equipment up to snuff so as to project the best screen image possible. That's Mac, always in there pitching.

- Wm. P. Covert, business manager for Toronto Local 173 and second IA vice-president, was appointed technical adviser to the labor delegate attending the 32nd session of the International Labor Conference which will be held in Geneva, Switzerland, June 8 to July 2 next. Covert was recommended for the appointment by the Trades and Labor Congress of Canada and was named for the post by the Federal Government. Bill sailed on the Aquitania from Halifax May 17.

- New York City's Fire Commissioner, Frank J. Quayle, takes pride in the fine fire safety record of his city. There has not been a single loss of life in theatre fires in New York City since the 1890's, and Quayle attributes this to the splendid cooperation between the theatre owners and the public. What the Commissioner failed to state explicitly is that the two-man operation in the projection rooms of motion picture theatres in New York plays a major role in keeping theatres safe for the movie-going public.

- Two vacancies in Milwaukee Local 164, one of which was created by the death of its business manager, Otto Trampe, and the other by the retirement of George Wittman, treasurer of the Local for the past 16 years, were filled

#### NIGHTINGALES WIN KRAMER 1949 TROPHY



Roger Kennedy (left), business manager for Detroit Local 199, accepts the William Kramer Trophy awarded the Detroit Nightingales in the first of a series of annual bowling matches with Cleveland Local 160. Tom Fitzgerald, president of the Cleveland Local, assures Kennedy that the return match in 1950 will see the trophy back in Cleveland.

#### NEW BRUNSWICK, N. J., LOCAL 534 HONORS TWO ORIGINAL MEMBERS OF UNION



Among the 75 guests at the party were, in the usual order, Eddy Kane, toastmaster; Louis Marcianite, president, N. J. State Federation of Labor; IA President Walsh, who presented the gold life membership cards; Thomas Coyne, charter member; Pat Rick, president Local 534; Thomas Shea, assistant IA president; Thomas V. Green, secretary IA 14th District; and Richard Fitz, business agent Local 534.

at the regular election held last month. Oscar E. Olson, business manager of the Local from 1933 to 1944, was once again elected to office, and George Brader was elected secretary.

The news of Olson's return as an act-

ive participant in Local affairs after an absence of four years, during which time he lived on the West Coast, was hailed by the members who have benefited handsomely in the past by Oscar's adept handling of their interests.

## IA ELECTIONS

#### LOCAL 1, NEW YORK, N. Y.

Joseph Dwyer, *pres.*; George Fitzgerald, *vice-pres.*; John C. McDowell, *rec.-sec.*; John J. Garvey, *sec.-treas.*; Solly Pernick, John Goodson, *business managers*; Louis Yeager, *tele. organizer*; Jack Shapiro (chairman), John Brousseau, Frank Kaiser, *board of trustees*; E. J. Mortimer, *sgt.-at-arms*.

#### LOCAL 164, MILWAUKEE, WIS.

Glenn C. Kalkhoff, *pres.*; Walter Behr, *vice-pres.*; Robert Lucht, *rec.-sec.*; Oscar E. Olson, *bus. rep.*; George Brader, *treas.*; August Mommer, *sgt.-at-arms*; Myrl Melton, *trustee*; John Black, Norman Habersat, Charles Beggs, Irvin Rotter, *exec. board*; Oscar Olson, Glenn Kalkhoff, *del. Wisconsin State Fed. of Labor*; Oscar Olson, Glenn Kalkhoff, Robert Lucht, *del. IA Convention*.

#### LOCAL 277, BRIDGEPORT, CONN.

Roland J. McLeod, *pres.*; Frank Toth, *vice-pres.*; Leroy Nickerson, *fin.-sec.*; Thomas E. Colwell, *rec.-sec.*; John A. Martin, *bus. rep.*; Fred Lewis, *treas.*; John C. Lynch, *sgt.-at-arms*; John Benard, Frank Gorman, Harold Ryckman, Joseph Cossette, Roland McLeod, Frank Toth, Leroy Nickerson, *exec. board*; Leslie C. Blakeslee, Harry Kaplan, George Antoniak, James Liburdi, and Joseph Cink, *trustees*. Peter Benard, John Benard, Roland J. McLeod, Leroy Nickerson, Joseph Cink, *del. Central Labor Union*; John Martin, Roland McLeod, *convention del.*; Frank Toth, Harold Ryckman, *alternates*.

#### LOCAL 324, ALBANY, N. Y.

Rocco Memole, *pres.*; Eugen Kelsey, *vice-pres.*; Edward E. Wendt, *bus. rep.*; Charles U. Hill, *sec.-treas.*; Don B. Shepard, *rec.-sec.*; Samuel Cooke, *sgt.-at-arms*; George W. Selley, John H. Ray, LeRoy Lehr, *trustees*.

- We mentioned in these columns last month that Sam Bonansinga, business manager for Local 138, Springfield, Ill., was appointed to the vice-presidency of the Illinois State Federation of Labor. We neglected to state that Sam is the *first* IA man to hold such high office in the Illinois organization.

- An inspiring picture, "The City of Hope," depicting the humanitarian work carried on at the famous tuberculosis sanatorium at Duarte, Calif., was shown at a meeting last month of the delegates of the Central Labor Council of Los Angeles. Charlie Vencill, secretary, and Paul Mahoney, assistant business manager, Los Angeles Local 150, supervised the presentation, and Nick Abdo, member of the Local, ran the film.

- *Correction:* In IP for April, under the heading "IA Elections" (page 24), we misspelled the name of Joe A. Campbell,

#### MONKEYSHINES IN HOLLYWOOD



Pat Offer, projection chief at Monogram studios, with a little helpmate at the preview screening of "Bomba."



Al Boudouris of Theatre Equipment Co., Toledo, Ohio, contributes this shot of the Century projector installation at the Paramount Theatre, Toledo. Shown are projectionists Francis McInerow, Harold Plumadore (also business agent of Local 228), and Harold Neuart, electrical engineer.

member of the executive board of Local 316, Miami, Fla. Please excuse us, Joe.

- Virus X bedded our good friend Jake Pries, business manager for Atlanta Local 225, for quite a spell. No sooner had Jake left his bed than the very personable Mrs. Pries was stricken with the same malady. Both, we are happy to report, are completely recovered.

- Miami, Fla. boasts of having one of the very few daylight Masonic Lodges in the country. The Meridian Daylight Lodge No. 274, F and AM, has a membership composed almost entirely of men who work at night, with meetings being held at 10 o'clock in the morning. The annual installation of officers is held at 5 a.m. each December 27, which is the beginning of the Masonic year. Joe A. Campbell, executive board member of Miami Local 316, is secretary of the Lodge.

- Frank Kinsore, president of Detroit Local 199, was appointed to the Michigan State Fair Board of Managers.

- Rudy Kner, 55, died on May 6 after a long illness. Rudy was associated for more than 30 years with the manufacture and sale of Simplex Projectors, first with Peerless Machine Co., then with International Projector Corp., and finally with National Theatre Supply Co.

Rudy traveled extensively through the United States and Canada on behalf of Simplex and thus became known to thousands of projectionists who appreciated his fine technical skill no less than his affable, generous nature. He is survived by a daughter and by a son who is a priest of the Roman Catholic church.

#### First Movie Show in a Theatre

April 23 marked the 53rd anniversary of the first exhibition of motion pictures in a theatre. That evening in 1896 Thomas Armat operated a projector of his own design in Koster & Bial's Music Hall in downtown New York City.

## Safety Film is Now 1/6 of All Prints; Estimate 1/4 Level by Sept. 1

**R**ELIABLE information reaching IP from the exchange centers throughout America indicates that the use of the new Eastman Safety Film (High Acetyl Film 5302, as it is officially designated) has reached such proportions as to constitute almost one-sixth of the total number of release prints now in circulation. The Safety Film figure would be considerably larger were it not for the existence of a large backlog of features made and for which prints have already been provided.

It is understood that Eastman hopes to provide sufficient Safety Film by September 1 next to increase the proportion to

one out of every four of the total number of release prints then in circulation.

The introduction of Safety Film was attended by comparatively little difficulty, considering the many complex problems which had to be overcome. Of course, even the most careful advance planning and detailed briefing of laboratory, exchange and projection personnel did not suffice to prevent those errors which seemingly are unavoidable in any project of such magnitude.

The labs were tripped up on not a few occasions; the exchanges made the expected errors of improper casing and

(Continued on page 27)

### INSTRUCTION CHART ON SPLICING



A good ciné splice is a **WELD** which joins two like surfaces together. To do this, the film base must be prepared by removing the layers covering it. The film has more layers than is commonly known. First, there is the emulsion layer A, then a thin invisible binder layer B, which binds the emulsion to the base, and then the base itself C which is about one two-hundredth of an inch in thickness. The back of the film may also have a layer D of oil or of residue from processing which can be removed by delicate scraping or by wiping with a cloth wetted with alcohol.

commonly known. First, there is the emulsion layer A, then a thin invisible binder layer B, which binds the emulsion to the base, and then the base itself C which is about one two-hundredth of an inch in thickness. The back of the film may also have a layer D of oil or of residue from processing which can be removed by delicate scraping or by wiping with a cloth wetted with alcohol.

#### GOOD AND BAD SPLICES



**This is bad.** The emulsion has not been removed completely.

**This is also undesirable** but may hold for a while. The emulsion has been removed but the invisible layer and the deposit on the back of the film remain.

**This is weak.** Careless scraping has gouged the film. This splice will eventually break in this weakened area.

**This is best.** Both emulsion and invisible layers have been removed and the deposit on the back scraped away. This permits a perfect weld between the two surfaces.

**Too little cement** causes a starved joint that will soon separate. Inadequate pressure in splicing also produces this condition.

**Too much cement** makes the splice buckle and hence produces a noticeable effect on the screen.

**In splicing, close the clamp immediately after applying cement to the scraped portion. A WELD will form only when the joint is wet.**



The above diagrams show the film thickness exaggerated to a much greater degree than the width of the splice for purposes of illustration.

# Optical Factors in Arc Lamp Design

*This exchange of views between author and manufacturer is in line with IP's long-standing policy of providing a forum for the exchange of views between anybody and everybody having anything interesting to say anent the projection process.*

By J. K. ELDERKIN

Forest Manufacturing Corporation

IN THE article "The 'Matching' of Projector Optics" in IP for March†, it appears to me that the author, Robert A. Mitchell, has not considered some of the practical points which must be met in lamp and projector combinations.

In order to obtain maximum light from a lamp and projector lens system, one must start from the aperture and work back from there. A 35-mm film aperture is 26 mm across diagonally, therefore the spot diameter must be more than 26 mm or the corners of the screen will be very dark and discolored. The spot must overlap the corners of the aperture sufficiently to give some semblance of even light distribution. The greater the spot size, the more even will be the light distribution.

## Correlating the Various Factors

Let us assume that the spot diameter should be  $32 \text{ mm} \pm$  in diameter for suitable light distribution. The next step is to arrive at a magnification ratio to reduce the size of the spot, since the diameter of the crater  $\times$  the magnification ratio give spot diameter.

The crater of the carbon is approximately  $23/32$ , or  $0.719 \times$  the carbon diameter. Assuming that a 9-mm carbon is being used, the crater diameter is 6.47 mm, then the magnification ratio must be 5 to obtain the  $32 \text{ mm} \pm$  spot.

We now have two things fixed: spot diameter and magnification ratio. The next thing requiring consideration is how close to the reflector can the arc burn without injury to the former. By cut-and-try, we find that a 75- to 90-ampere arc must be burned at a distance from the reflector of from  $6\frac{1}{2}$  to 7 inches to prevent cracking.

This condition, then, sets for us the equivalent focus of the reflector. With 7 inches as the equivalent focus, our working distance is set, because the magnification ratio  $\times$  the effective focus equals the working distance; or  $5 \times 7$  equals 35 inches, which is our working distance.

We now have working distance, effective focus and magnification ratio determined for us by the nature of the equipment. The only thing left that is variable, then, is the diameter and depth of reflector and its  $F$  speed.

Since working distance is already fixed

at 35 inches, as cited previously, then the diameter of the reflector  $\times$  the desired speed, plus the reflector depth, must equal 35 inches. Assuming 16 inches for the diameter of the reflector and a speed of  $F: 2$ , then  $16 \times 2$  equals 32, which means that the depth of the reflector must be 3 inches to make the 35-inch working distance.

Suppose we were to use a 12-inch diameter reflector with a speed of  $F: 2.5$ —then the reflector depth would have to be 5 inches. On the other hand, where we want a speed of  $F: 1.5$  with a 12-inch reflector, its depth would have to be too great to be practical. On the basis of  $F: 1.5$ , reflector diameter must be increased greatly to, say, 20 inches, and then a 5-inch depth could be used.

The point to all this is that we must have a certain size spot, we must keep the arc a certain distance from the reflector, we must hold to a practical working distance in order to place the lamp behind the projector with front shutters, we cannot make reflectors larger than will fit into a lamp, etc.

We are thus left with just a few factors which are variable and these are limited by practicability. We can only hope to produce the greatest possible light at the aperture.

## Speed of Objective Lens

The same holds true for the objective lens, which should be selected to take advantage of the light from the reflector without overcrowding. There are limitations here, also, based on practical considerations, but if the same formula be

used as is used for the reflector, it makes no difference whether you call its  $F$ -speed 0.5, 1.6, 2, or any other number. The point is that they should match each other insofar as is practical.

A new formula does not change the mechanics of light transmission, which have been pretty well proven with the passage of time.

By ROBERT A. MITCHELL

THE information contained in Mr. Elderkin's most interesting letter has little bearing on the principles of lamp-projector optical matching which formed the main subject of my article; but considered as an addendum to that, Mr. Elderkin's comment serves to emphasize the various practical considerations by which the unwary may easily be ensnared. The statement that lamp manufacturers "cannot make reflectors larger than will go into a lamp" injects an element of humor into the discussion.

The procedure by which any manufacturer "roughs out" a tentative lamp optical system merely sets the stage for the really tough problems to follow. Had I intended to offer a review of these matters in the article in question, I should certainly have mentioned some of the paramount problems which follow the elementary preliminaries outlined by Mr. Elderkin.

## Light Distribution Vital Factor

That, however, was not my intention, hence I do not consider that I am in any way guilty of ignoring "some of the practical points which must be met in lamp and projector combinations." And if that *had* been my intention, I would have concentrated attention on projection lenses, rather than lamps.

Now that the subject has been intro-

(Continued on page 25)

## NATIONAL THEATRE SUPPLY CO. EASTERN MANAGERS DISCUSS NEW PRODUCTS, METHODS

In the usual order: Jack Servies, district supervisor and purchasing agent; H. J. McKinney, Boston; A. F. Baldwin, export manager; R. W. Pries, Philadelphia. Seated: W. J. Hutchins, Albany-New Haven; Allen Gordon Smith, New York; N. C. Haeefe, Baltimore; V. G. Sanford, Buffalo; and W. J. Turnbull, sales promotion manager.





# TELECASTS

## NBC Advises Exhibitors of Tv Facilities Available

**A**LTHOUGH the National Broadcasting Co. will not permit the use of its Tv program material on the large screens of motion picture theatres without a specific license, the network places no barriers on the use of home receivers in theatre lounges or lobbies, Charles R. Denny, executive vice-president, has informed the Theatre Owners of America.

In addition to a clarification of this long-confused issue, Denny told the TOA that three principal types of Tv programs were potentially available for large-screen theatre exhibitions when licensed. These included:

### Three Principal Program Types

(1) programs which NBC might build specially on order from the theatres for their primary use; (2) special event programs which form part of NBC's Tv programming and are not normally sponsored, such as a Presidential inauguration or an important public address; and (3) NBC's regular Tv programs which are sponsored by advertisers or are carried on a sustaining basis.

"Only the first category of programs, those which NBC might build on order from theatres, might be made available for exclusive theatre use," Denny declared. "In the other two categories, the broadcast use would be the primary use made of the material although where NBC controlled or could clear all rights, arrangements might be made in appropriate cases for simultaneous or subsequent showing in theatres."

A condensation of RCA's answers to the TOA's queries follows:

**Will NBC provide the necessary equipment for theatre Tv screening?**

Barton Kreuzer of RCA Victor, informs me that RCA is now taking orders both for the instantaneous or direct projection equipment for theatres and also for the 35-mm film storage equipment. These two types of equipment for theatre Tv will be available in limited numbers by the end of this year.

### Terrific First Cost Foreseen

Is it possible to approximate the cost of such theatre installations?

Mr. Kreuzer also advises me that the estimated cost of the instantaneous or direct projection equipment is about \$25,000, not including the cost of external relay equip-

ment, pickup cameras, or the expense of installation. The cost of 35-mm film storage equipment is variable, depending upon the particular type of installation required, but this equipment runs higher in price than the instantaneous equipment.

**Will NBC make available to exhibitors special sport and national events (such as Inauguration) which it carries on either sustaining or other basis to its affiliates?**

Where NBC owns or can clear all of the rights for theatre showing of programs of special sporting and national events, it would be prepared in appropriate cases to license theatres to use these programs for theatre showings. In cases where NBC is one of a group of broadcasters originating the program, NBC could not make commitments for the other broadcasters, and any arrangements for theatre showing would have to be made with the group.

### Commercials To be Included

Where the program is sponsored, as for example in the case of the major football games, the commercial announcements would have to be included in the material shown by the theatre, and the advertiser's consent would have to be obtained.

**Will service be made available to any and all exhibitors who want it or will it be on the same basis that NBC has its present affiliates?**

In the case of programs built by NBC specially on order for theatre showings, it should be possible to grant the theatres

ordering the special program an exclusive license for its use. In the case of programs created primarily for Tv broadcasting, and available for theatre showing, it would not be NBC's policy arbitrarily to exclude any theatre which desired to make arrangements for a license from NBC, from access to this material.

**On what basis would NBC make its charges?**

The fee which NBC would charge the theatres would be such as to cover its expenses attributable to providing the programs to the theatre, plus a fair profit to NBC. The fee would vary depending on the type of program and theatre involved, and initially, at least, would be subject to negotiations in each case.

### Transmission Means Suggested

**What mechanical means will be used for the transmission of programs to the theatres?**

Where theatres are sufficiently close to the source of transmission of a show originated by NBC for broadcast purposes, direct pickup of the broadcast by the theatre is possible, with NBC's consent. I am sure that you are familiar with the study theatre operators have given to the possibility of using coaxial cable or radio relay circuits where direct pickup is not feasible.

**Will the programs made available to the theatres be sponsored by advertisers?**

Presumably, the programs created specially for theatres would not be commercially sponsored. As indicated previously, if arrangements were made with the advertisers' consent for showing by theatres of regular commercial Tv programs for which the necessary rights had been cleared, the programs as shown in the theatre would have to carry the associated commercial announcements.

\* \* \*

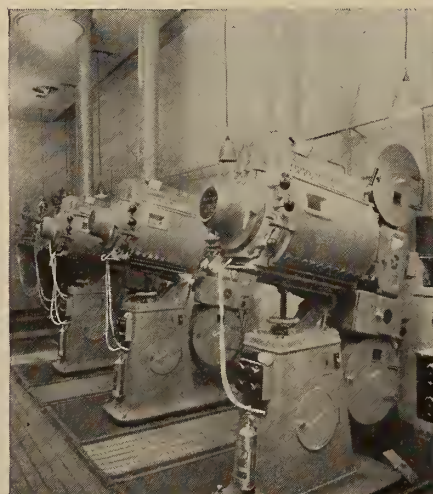
## Predicts 100% Theatre Tv

"As surely as they converted to sound in the 1930's," all exhibitors eventually will equip their theatres for showing Tv programs on their screens, Paul Raibourn, Paramount vice-president, predicts in an article in *Elks Magazine* for April.

Expense of such a move, Raibourn said, will be justified by the "best guarantee or protection in the world—the assurance that human nature does not change. Everything in life is better when it is shared, particularly an emotional experience."

Arguing that Tv will not hurt the theatre, but can be put to work for it, Raibourn declared, "I'll go a step further and even venture to suggest that Tv may make the neighborhood movie house of the future the community center and focal point of public opinion."

### PROJECTION IN THE ANTIPODES



Comparing favorably with America's best is this projection room in the Regent Theatre, Melbourne, Australia. Complete installation by Westrex, including Australian-made arc lamps of indubitable American design much like the Peerless.

## Addendum to SMPE Screen Brightness Report

**P**POINTING up the more significant aspects of the report of the Screen Brightness Committee of the SMPE (published in IP for March, 1948, p. 16, under the heading "Wide Variance in Screen Light Levels") is the appended discussion which followed formal presentation of the report to the Convention. Procedural methods and equipment used are detailed in this discussion, along with the opinions of various members who have had wide experience in the light projection field.

**Q.** Has the Committee established what would be a desirable screen brightness for theatres?

**A.** The present standard is 9 to 14 foot-lamberts as measured at the center of the screen, with the projector running but no film in the gate. Whether that standard will be changed I am not prepared to say.

### SMPE Standard Ultimate Aim

**Q.** The concerns that sell equipment are not equipped to advise a man who contemplates building a theatre and comes to the supply house for advice. They don't seem to know just what results will ensue from a different throw in a house of given size, for one thing. Why should they not know this basic information?

**A.** By finding out the present practice in

theatres, by proper measuring instruments, and by knowing what each piece of equipment will deliver, it will be a natural evolution that that sort of thing will occur: the equipment in the theatre will be matched to meet the SMPE standards.

**Q.** Knowledge of the surrounding brightness is very important in interpreting the data you have given. Is there any intent on the part of the Committee to gather data on the screen-brightness level, excluding the projected light?

**A.** That is part of the longer-range objective of the Committee, but it has not been a part of the immediate program. The initial phases are aimed mainly at determining what methods and equipment should be used to measure brightness and illumination and to determine present practice. Some of those other things we all hope will come along a little later in the program.

**Q.** I assume that during the course of your survey you did not visit any studios. Do you intend to do so?

**A.** Not at present. The main intent is to determine the practice in theatres.

### Basic vs. Operational Defects

**Q.** There was one point on which I was not exactly clear. You mentioned that 50 of the theatres were getting 75% of the available light. Do you mean that there were misadjustments in the equipment or

do you mean that the equipment was rated at a higher rating than the theatre actually was using?

**A.** Data have been published indicating the total quantity of light that could be expected from various combinations of arcs and optical systems. Those data were taken into consideration along with the exact projection equipment in the theatre. The Committee did not investigate why that difference occurred.

### Screen Characteristics Vital

**Q.** The factor of the screen itself and the light coming from it represent additional items that are elusive. I wonder if this report will include that eventually? One is the age of the screen; two, the location of the screen, the atmospheric condition; three, the polar characteristic of the screen.

Unless we investigate all these things, the changing factor of what you are getting off that screen is amazing. Unless we add those data, we do not know what actually is getting to the people's eyes.

**A.** The age of the screen with its condition was not specifically investigated. The Committee went into the theatre and measured what the condition was at the moment. Whether it was a new screen or an old, a dirty screen or a clean screen, was not considered.

With reference to the condition of the atmosphere: since all these measurements were made without any people in the house, I suppose we could assume that the atmos-



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## BAUSCH & LOMB

OPTICAL COMPANY



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pheric conditions were best.

We expected to consider the polar characteristic, and we still hope that the information we have will show that. You recall the slide on which was shown where and how the brightness was measured. The brightness reading was taken at the center of the screen and at the upper left- and lower right-hand corners, from four extreme positions in the theatre.

When we have sufficient information available from a more intensive survey, all of those data can be analyzed to tell what is the polar characteristic of the screen. While the indications are not definite, they tend to show that the screens all were matte and had a fairly uniform reflectivity within the

angles encountered in the particular theatres surveyed.

### Brightness vs. Film Density

Q. What brightness is best for different density conditions of film, or what lambert will produce the best contrast value for discerning image detail? The light values alone will not give us the ultimate answer unless we have tests made with actual film strips.

A. That point is realized, but the Committee chose to consider first things first. One of the basic unknowns was the present value. Once that is determined, our activity can be enlarged to include such very pertinent questions as you have raised.

Q. Will not that affect the recommended

foot-lambert measurement?

A. It probably will if it is demonstrated by proper tests that the standards should be changed. Right now the standards are 9 to 14 foot-lamberts.

Q. Could you give us a little more detail as to the type of instrument with which you measured the brightness?

A. That was a Luckiesh-Taylor visual photometer.

Q. I am not familiar with that. Can you tell definitely what part of the screen you are looking at when you look through the instrument? Is it a focused image?

### Sectors of Screen Measured

A. You can use either a view-finder, which we did in some instances, or by locating on the screen at the same time some one is measuring illumination with a photronic cell, it is possible to tell where you are on the screen, and knowing the angle of acceptance of the instrument and the distance you are, you can tell what portion of the screen you are actually measuring when you are measuring brightness.

Q. I assume, then, you did not use the Weston instrument that is available to a limited extent right now?

A. For measuring brightness?

Q. Yes.

A. I am not familiar with that one.

A. It is a foot-lambert meter which has been put out on a small scale.

Q. Based upon the wide variance of percentages that you found existing in different theatres, would you not come to the conclusion that possibly a great deal of the fault is based upon the poor quality or outmoded use of the screens and the projection equipment used.

A. I do not think the Committee has done enough to take any stand at all on that.

Q. Because of the wide variance in your percentages found—in some cases your results were of a high degree and in a great many cases they were of low degree—you can, therefore, come to but one conclusion: either the screens were old, dirty and outmoded, or the light projected from the projection room was not adequate.

A. Certainly if you are investigating the basic reasons for those things which were discovered, you have two factors to consider: what light is projected to the screen and what is reflected. On a very broad generalization, the reasons why the brightness was not up or why the light intensity was not what it might have been have to be attributed to one or the other. That was not determined in this survey.

Q. I quite understand that, but I think it would be the object of your Committee to find out whether or not the equipment in use in the theatres of the country, screens, projection equipment, light sources, and everything involved needs replacing and can very well stand it.

### Point-to-Point Measuring

Q. I notice that the projection distance was measured from the aperture to the screen. I have always considered that this distance was measured from the front surface of the lens nearest the screen to the



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screen itself. The lens constitutes the last light source in the optical train.

Inasmuch as the foot-candles on the screen are determined absolutely by the brightness of the lens and the lens area, the effective lens area—which varies inversely as the square of the distance—the discrepancy becomes somewhat larger. Why was the distance chosen as being from the aperture to the screen?

A. It is more a question of saying that it was from the aperture to the screen, rather than a specific measurement. The determination of that distance was made by measuring from the screen to the point in the theatre on a parallel under which we estimated the projector to be, and then calculating from the projection angle what the actual distance was.

I am quite sure that those figures are not accurate to better than six inches; but even considering the shortest throw, an error of plus or minus six inches will not be more than 1%.

Q. I brought the question up merely for the sake of accuracy, because the projection distance is actually measured from the last lens in the system, which is the distance from the lens to the screen.

#### Reflection Factor of Screen

The second point is related to the relatively low values of reflection for these screens. Was that reflection factor determined on the basis of an integrated effect over an appreciable area of the screen which took into account the screen perforations, or was that intended to represent the coefficient of reflection of the screen surface itself—that is, the reflecting efficiency of the screen surface?

A. That was determined by taking the ratio of the brightness measured at the center of the screen to the light intensity at the center of the screen. The brightness-measuring instrument probably did not include more than an area of from one to two square feet. It certainly took into consideration if there were holes in the screen as it existed in the theatre at the center.

Q. It was an integrated effect?

A. For a small area at the center of the screen.

Q. There again the actual coefficient of the reflection of the screen surface would be higher than is shown.

A. You mean of the unperforated screen?

Q. That is right.

A. I expect that it would be.

#### BOOK REVIEW

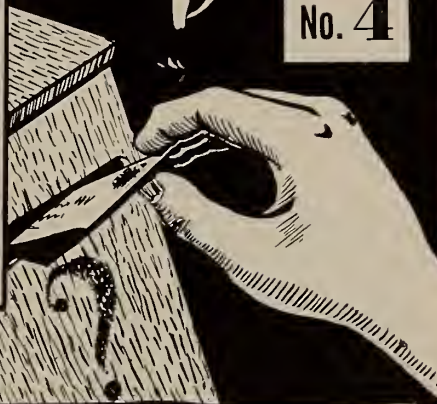
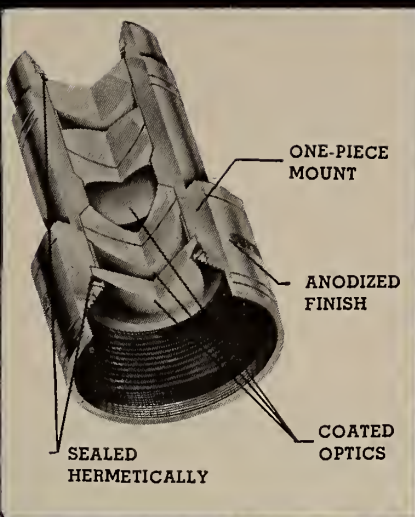
**SOUND TRACK BOOK OF THE THEATRE:** a compendium of articles which have appeared from time to time in "The Sound Track," merchandising organ for Motiograph dealers. 445 pages, 6¼ x 9¼, profusely illustrated, including color plates, indexed. The Sound Track, 1001 West Washington Blvd., Chicago 7, or Motiograph dealers. \$10.

Those who have read "The Sound Track," promotional organ for products distributed by Motiograph dealers, are very familiar with the type of technical articles contained

## f/19 SUPER-SNAPLITE

Question  
Box

No. 4



#### IF THE SPEED OF THE LAMP IS SLOWER THAN THE LENS, WHY USE A FAST LENS?

This is answered in detail in an article by Dr. J. L. Maulbetsch in the "International Projectionist" of September, 1947. In brief, a fast lens gives more uniform illumination because having larger lens elements it picks up more of the edge illumination than a slower lens with correspondingly smaller lens elements.

#### ARE ADAPTERS NECESSARY FOR SNAPLITE LENSES?

Fittings are available to adapt, where necessary, Snaplite lenses to all currently manufactured professional projectors.

#### WHERE CAN DRAWINGS OF THESE ADAPTERS BE OBTAINED?

The required adapters are shown on the last page of Kollmorgen bulletins 204 and 206. These bulletins are available at your theatre supply dealers. Dimensions of all adapters except the shade tube are fixed. The length of this shade tube varies with the focal length of the lens.

#### HOW MANY LENS ELEMENTS ARE THERE IN A SUPER-SNAPLITE?

Six—two pairs of elements are cemented together and two elements are single.

#### ARE THE CEMENTED SURFACES COATED?

No—treating cemented surfaces with an anti-reflection coating would not increase the light transmission of the lens.



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Optical



**CORPORATION**

in this volume. Non-readers will understand that the bulk of the articles concern Motiograph products, but the foreword states that "the models described incorporate basic principles of design, so that a knowledge of their construction and operation will be found applicable in nearly all cases."

As so it is, particularly with respect to those articles relating to the principles of sound reproduction. The book is divided into three main sections: projection and sound, theatre management and maintenance,

and recent developments—the latter treating of drive-in theatres, television, and stereophonic sound.

Despite its almost exclusive concern with Motiograph products, this volume constitutes a worthy addition to the technical literature in that it offers rock-bottom data on the basic principles of visual and aural projection. Particularly effective are the large-scale illustrations in both line and halftone which are an invaluable aid to the text. Especially is this true of the color plates, which are models of clarity and precision.

While not much of this material may be said to be revelatory by reason of its newness, such a compendium under one cover of the basic principles of the art deserves a cordial reception and a wide distribution.

## PERSONAL NOTES

WILLIAM B. LODGE, vice-president in charge of engineering for Columbia Broadcasting System, has been named to the Board of Governors of the SMPE, marking the first time in history that a television engineer has been so designated.

JOHN F. CAMPBELL, for some time vice-president in charge of production for International Projection Corp., has joined the Luna Metal Craft Co., Inc., as operating vice-president. A subsidiary company, Ro-An Devices, has been formed to manufacture motion picture devices and equipment.

Western Electric Co. has announced the appointment of PAUL L. PALMERTON as acting director of public relations, effective May 1. He will succeed FRED B. WRIGHT as director of this activity when the latter retires on May 31.

E. ALLAN WILLIFORD has resigned as vice-president and general manager of the Ansco Division, General Aniline & Film Co. WILLIFORD formerly was head of carbon sales for National Carbon Co., is a past president of the SMPE as well as of TESMA. Future plans not announced.

## New W.E. 16-mm Rerecorder

A new 16-mm rerecorder designed to provide the basic qualities of 35-mm equipment, has been made available to its licensees by ERPI unit of Western Electric. Mounted in rack type cabinets, the machines may be placed in rows for easy

access and pleasing appearance. The film-pulling mechanism is similar to that used in W. E. recording equipment and reduces flutter to a maximum of  $\pm .06\%$  total or  $\pm .04\%$  at any given rate. No free loops are used in threading. Correct threading is assured by a small target which causes a black line to be centered in a circular opening when the correct sprocket hole is engaged.

Reels up to the 1600-foot size may be accommodated, with ample space remaining for manipulation and threading without congestion. The lower section of the upright cabinet is available for mounting such equipment as lamp and high-voltage power supplies. The rear of the cabinet is reached by a hinged door for access to equipment. Openings at the top allow for film exit and the use of an overhead loop rack. Motor driven rewind facilities are also provided.

## Probe 'Aerial Oxidation' of Compounds

How some chemical compounds "burn" or are oxidized at ordinary room temperatures is explained in a recent paper by Dr. Arnold Weissberger of Eastman Kodak's synthetic organic research laboratory. His paper is entitled "Recent Developments in Science".

Dr. Weissberger said that "while most organic compounds burn, or are oxidized, at higher temperatures, some chemical compounds are attacked by the oxygen of the air at ordinary room temperatures". Such oxidation is of great biological importance. And in photographic processing, he said, it causes waste because it uses up the chemicals with which the film is developed.

The first clue as to how "aerial oxidations" of some of these compounds proceed was obtained in 1927 through chance observation. "Since then," said Dr. Weiss-



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berger, "the rate of a number of oxidations has been studied. The compounds studied include the most important photographic developing agents and, also, compounds such as Vitamin C". From this research scientists understand better the effect of many of the compounds and how to avoid oxidation waste.

### Kodak's New 'VU' Film Emulsion

A new photographic emulsion developed for identifying atoms or chemicals through analysis of their radiant energies may prove useful for study of the sun from rockets. The new material, called a "vacuum ultraviolet" or VU emulsion, may be used in the thin atmosphere 250 miles or more above the earth, or in near-vacuum on the ground. It is sensitive to light far into the ultraviolet.

This VU emulsion, developed by Eastman Kodak, has extremely close-packed silver grains, with very little gelatin. The gelatin of a normal photo emulsion absorbs ultraviolet light. The new emulsion, with little gelatin, enables the ultraviolet light to be recorded. Ultraviolet rays of the sun are intense at high altitudes where the VU emulsion may be used. While the sun's rays in this form cannot penetrate the atmosphere, study of them is important because they occasion changes in our weather and radio communications facilities.

### Supersonic Speed Plus via Silver

In your change pocket it's a dime—"token money," metal worth less than six cents. Treat it chemically and spread it thin—a thousandth of an inch or less—and it becomes a miracle metal, as silver nitrate, the foundation of photography. Research scientists and engineers who have gone on refining the performance of this light-sensitive substance now report new miracles in speed.

Film now is made which will record an image with a light exposure of one-millionth of a second! Also, there are high-speed motion picture cameras which will take up to 20,000 frames per second!

These speed twins, based upon one of silver's many industrial uses, vastly improves many kinds of motion analysis studies, important to research, engineering and industrial operations. Slow-motion this lightning-speed stuff and it becomes possible to study many things heretofore unobservable and unknown.

### Return to Nomenclature Normalcy

Recent industry and public discussions of Tv assignments have demonstrated the confusion and futility of such terms as "Very High Frequency" and "Ultra High Frequency" in today's ever-widening electromagnetic spectrum. Such comparative definitions have already become meaningless and should be dropped from any further use.

To avoid further confusion, let's get back to the absolute and specific, such as "50-MC," "500-MC" and similar numerical delineations that will leave no doubt as to what we are talking about!—*Tele-Tech*.

## OPTICAL-ARC FACTORS

(Continued from page 19)

duced, what are some of the really practical considerations in lamp design? Mr. Elderkin mentions *efficiency* (maximum light output), and his entire outlined procedure indicates well how that end may be achieved. ("We can only hope to produce the best reflector possible within these limitations and thus produce the greatest possible light at the aperture.")

No mention is made of the *kind* of light aimed at, the *distribution* of light over the aperture area. Of course we want efficiency in a lamp, but we also want much more.

Projectionists should understand that there is vastly more to the "figuring" of mirror curvature than simply specifying mirror "depth" in inches or centimeters. There are all types of "curves" available to the designer—the simple conic sections, such as the circular, the elliptical, the parabolic, and the hyperbolic; and the not-so-simple curves, such as those utilized in the Schmidt compensating lens system.

### Mirror the Heart of System

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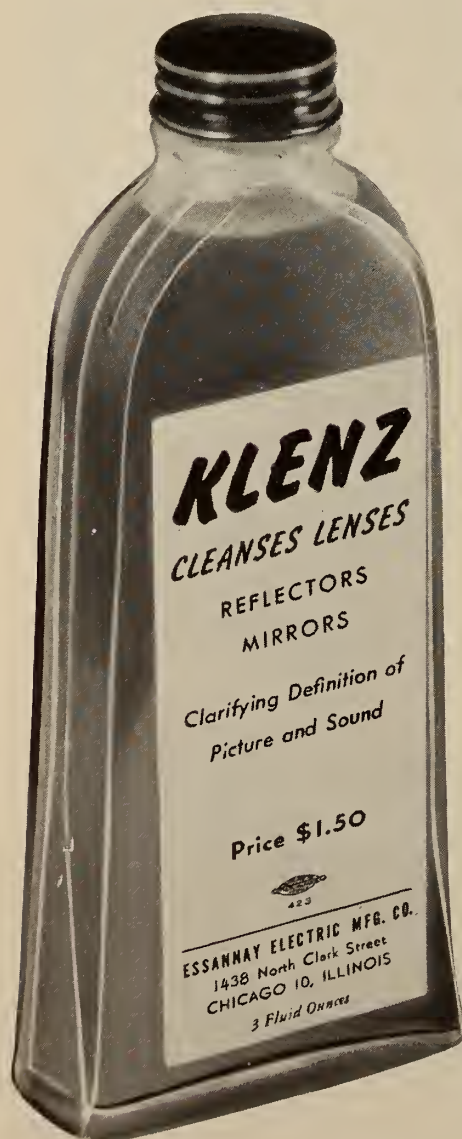
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we do expect sound scientific design. And because the mirror is the heart of a projection lamp, we expect a lamphouse to be designed for a specified type of mirror, not the mirror for the lamphouse.

### 'Hot-Spot', Vignetting Effect

Mr. Elderkin mentions, by way of illustration, the crater diameter of a certain high-intensity carbon. From this quantity he determines the magnification ratio required to give a spot of predetermined size. Well and good. But what is not mentioned by him, however, is the fact that the intensity of illumination varies very considerably across the face of a high-intensity crater, the brilliance being greatest at the center. As I pointed out near the end of my article, corrective optics are necessary to overcome a serious hot-spot, or vignetting, effect. The same point is brought out by Mark Stevens' article in the same issue of IP.<sup>†</sup>

One may profitably inquire, therefore, if a given lamp mirror is so inexpertly "figured" that a light-wasting oversized spot is necessary in order to obtain a reasonably uniform field of light on the screen. A mere "semblance" of uniform screen illumination, to use Mr. Elderkin's own term, is not enough.

Performance is measureable, optimum performance is assignable, and performance in the field is the real criterion for any commercial device. Performance, let it be added, has qualitative as well as quantitative, aspects.

Mr. Elderkin is, of course, correct in

<sup>†</sup> "Total Lumens vs. Screen Light Distribution," by Mark Stevens; IP for March, 1948, p. 20.

### 200-Inch Palomar Telescope Joins Photography in Epochal 'Shots'

Even the power of a million human eyes falls short of that of the new Hale Telescope atop Mt. Palomar in California. The 200-inch telescope is really a huge camera—the world's biggest—and it has the strength which photography alone can give it.

In theory, the "big eye" has the light-gathering power of a million human ones. Actually, the telescope is far better than this would suggest. Why? Because the photographic plates used in the telescope can be exposed for long times—hours, if needed—to catch light human eyes would never see; make lasting records; provide "observations" for many people to see and study.

Kodak is now making special photoplates for use in the 48-inch Schmidt telescope, which will work in partnership with the 200-incher at Palomar. Other Kodak plates will be used in the Hale telescope when it gets into operation in future months.

The first five-year task for the Schmidt, or "Big S," will be to map the universe. The main use of the Hale telescope will be to collect the faint light from very distant stars. Its "range" is a billion light years. A light year is the distance light travels in one year at 186,000 miles a second—or about six trillion miles.

stating that "a new formula does not change the mechanics of light transmission." The "new" general formula for matched optics which I set forth for the convenience of projectionists pays acceptable homage to the geometric principles of light transmission, and, like any other law of nature, it does not *command* that something shall take place but only states *how* something happens.

The general formula permits *any* type of lamp to be designed, good or bad, and it also allows any spot diameter to be used: it has nothing to do with those matters. I feel that projectionists are under no misconception in regard to the general formula. It is a searchlight to reveal the deficiencies of various lamp and projector combinations. Only those who would say that there is no room for improvement in projection optics can logically deny this.

### Applicable to All Optical Systems

The general formula applies to all motion picture lamp optical systems regardless of the diameter of the mirror, the working distance, and the geometric focus. It instantly reveals any failure of a projector optical system to meet the requirements of *perfect* optical matching. Indeed, this may sometimes be an embarrassing revelation, but in no wise

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does it reflect unfavorably upon any lamp, no matter how unsound its design or poor its performance.

All that the general formula discloses is the simple fact that in most cases the lamp system and the lens are unsuited to each other. This "optical incompatibility" results in a poorly and unevenly illuminated picture on the screen, and the defect is ordinarily corrected by changing the lens, not the lamp.

The problems connected with the designing of projection lenses, Mr. Elderkin's statement to the contrary, are in no sense strictly analogous to those involved in mirror design.

### Discussions Serve the Art

Of course, I had rather be 100% wrong than to have no attention whatever paid to these extremely important matters by the manufacturing end of the industry. Far from bristling and opposing the publication of such data, manufacturers should enter into the true spirit of the occasion and cooperate wholeheartedly in an effort to effect improvement—for their own sakes as well as for the good of projection generally.

I personally feel that the welfare of the projection craft is being served admirably by these open discussions and little controversies. After all, no fair-minded person wishes to hide the truth.

### SAFETY PRINTS INCREASE

(Continued from page 18)

marking, not to mention the inevitable quota of defective splices; while the projectionist craft had its troubles, particularly in that period preceding the joint Eastman-IP educational program which pretty effectively blanketed the theatre field down to the smallest crossroads operation with precise data anent the handling of the new stock.

Despite this fine educational job the pronounced upsurge of Safety Film in the theatre field (no less than the demonstrated truth of the old adage that one needs not so much to be told as reminded) makes it advisable to reiterate those salient features relating to the proper handling of acetate stock by the projectionist—and, for that matter, by the exchanges.

The matter of attaining a satisfactory splice with Safety Film revolves around the twin factors of a proper film solvent and correct operational procedure. Since the proper solvent is now generally available, the only remaining consideration is correct procedure. Bearing on this point is the accompanying instruction chart which not only conveys data relative to the fundamental structure of the film support but also details correct splicing procedure.

A razor blade is not considered to be

a desirable splicing tool. Its use creates rather than diminishes splicing trouble. Of major importance is the condition of the splicer used. On the Griswold splicer, for example, make sure that the center bar (shear plate) is not etched, because such etching will tend to tear the corners of the film.

### Scraping Blade Replacement

Highly important is the frequent substitution of a fresh scraping blade. The blade on a Griswold splicer may be turned frequently to offer *eight different scrap-*

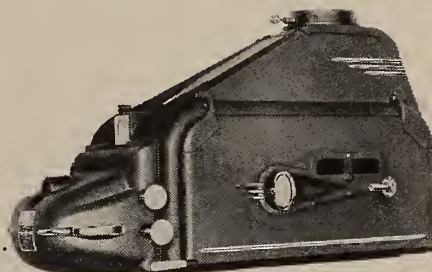
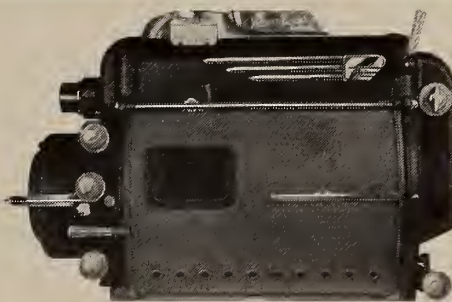
*ing surfaces.* About 25 scrapings per surface is the maximum number that should be made before the blade is turned. When all eight surfaces have been utilized (200 scrapes) a new blade should be inserted. Spare blades should always be on hand.

It is advisable to work from the center of the film frame toward each edge, rather than to make one continuous scrape the width of the frame, so as to avoid those errors shown in the accompanying chart. After the emulsion has been removed, be sure to scrape off the

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invisible binder layer (B in the chart) until the rough white surface of the base evidences no gloss by reflected light. It is especially important that the area around the perforations and at the ends be perfectly clean.

After the shearing operation, lift the splicer clamp just a trifle to permit application of the cement, thus keeping the plate as clean as possible. Apply the cement in one firm, continuous stroke with the brush, as opposed to a "lather-

ing" up-and-down motion which involves the use of excess cement and will only cause trouble, usually a "bumpy" patch.

#### Application of Pressure Vital

Once the cement is applied, it is important that the pressure clamp be brought down *immediately*: lower it slowly but firmly instead of with an abrupt clamping-down, which tends to splash the cement and thus thicken the splice.

Hold the pressure clamp down for not less than 10 seconds: additional time will not compensate for previous procedural errors in terms of effecting a stronger bind. Upon releasing the pressure clamp, wipe off any excess cement from the splice itself and from the center splicer bar.

The removal of the sub-layer (see B in chart) is somewhat more critical on Safety than on nitrate base and requires close attention on the part of the projectionist. Duplitzed film, whether Safety or nitrate, has emulsion on *both* front and back surfaces and is much more difficult to splice than single-coated stock. All duplitzed film stock (Trucolor, Mag-nacolor, Cinecolor, etc.) must have *both* sub-bases scraped on *both* ends of the film to be spliced before a secure join can be made.

**IMPORTANT:** *Always* examine the edge-markings of *all* film, features or shorts, before projection, so as to distinguish between Safety and nitrate stock. Buy the smallest available quantity of film cement at one time so as to insure constant freshness. Keep the cement bottle covered at all times when not in use.

## PSYCHOLOGICAL ELEMENTS IN PROJECTION

(Continued from page 15)

struction of the masking frame determines whether the inserts are placed before or behind the battens. Trial corner inserts may be cut from dead-black cardboard and used for several weeks, if desired, while the matter of a permanent fitting is being considered. Attention to the following points is imperative.

- (1) The corner inserts must have smooth quarter curves absolutely identical one with another.
- (2) The radius of the curvature must be exactly 1/16 screen width. (Divide the screen width expressed in inches by 16, or else multiply screen width in inches by 0.0625 to obtain the same result.)
- (3) The blackness and "deadness" of the inserts should match the rest of the masking.
- (4) Standard round-cornered apertures must be installed in the projectors. (These are readily procurable, and the cost is trifling.)

In most cases the permanent corner inserts may be made of non-warping plywood or pressed fiber-board. The inserts are faced with the same type of cloth used for the rest of the masking. In theatres where dyed cotton or other thin material is used, a complete replacement of the masking is in order. Only black velour or an equally "dead" material is suitable for screen masking. The slight overlap of the projection on the masking should be invisible to the audience.

Some projectionists consider screen masking undesirable. The objection to masking is aimed primarily at the sharp cutoff produced by the inch or two overlap of the picture on the masking material. The unpleasing character of projected aperture edges prevents the writer subscribing to the views of that group.

Long-focus lenses project a sharp image of the aperture on the screen when the film is in focus; while short-focus lenses give a rather fuzzy aperture image. A small projection angle results in a properly proportioned aperture image; but a steep angle introduces key-stone distortion.

Standardization of the character of the "framing" would be impossible if masking were entirely discarded. Moreover, the accidental lodgment of dust particles upon the aperture edges would cause the outline of the picture image to become ragged, and thus attract the eye. "Whiskers," no matter how small, are annoying. Then, too, machine movements affecting the image as a whole would be more conspicuous, and changeovers would force themselves upon the attention of the audi-



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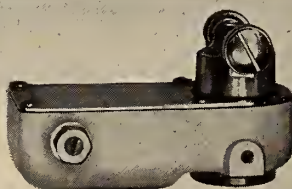
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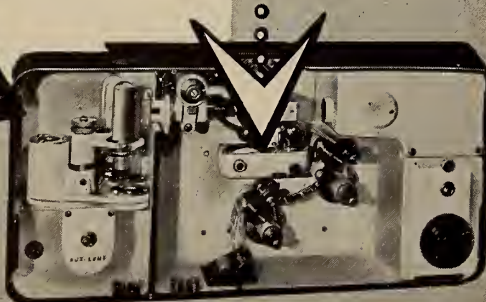
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ence by a minute, but readily visible, alteration in the image outline.

### **Vignetting Proposal Disapproved**

Another group advocates a vignetting type of screen masking. The effect sought is a fadeaway of light at the edges of the picture to give a blurred boundary. The selling talk for this type of masking is, in general, much better than the actual masking. The results, be assured, are disappointing because of the serious encroachment upon large areas of the screen and a disconcerting impression that panoraming and dollying shots are being viewed from the opening of a tunnel.

Vignetting of the screen is an ill-advised attempt to take the bull by the horns and physically impose on the screen image that which is introduced psychologically, and much more effectively, by sharp cutoff, round-cornered masking. When vignetting effects are required to increase dramatic effectiveness, the cinematographer will mask his camera lens to produce such an effect.

Some scenes are enhanced when blurred by a romantic haze, but no sane projectionist would consider placing focus-softening filters over the projector lenses! The same line of reasoning applies to vignetted screens. A sensitive showmanship arising from inborn intuition prefers suggestive rather than brute-force measures.

Many scenes—most scenes, in fact—are better without vignetting. A sharp picture cutoff *psychologically* raises picture illumination at the edges of the screen, thus counteracting to some extent defects in the projector optical system which give rise to undesirable vignetting. Admitting that the desirability of avoiding vignetting seems to contradict the principal purpose of rounded screen corners, the psychological veiling of the definiteness of the picture boundaries by such masking allows us to adopt perfectly uniform screen illumination with impunity.

### **Allied Problems Important**

Those who consider screen corners unimportant must, if they are logical, continue on to the premise that the whole matter of masking is of no consequence. The writer has proved to his own satisfaction the tremendous importance of screen corners faction by extensive experimentation under a variety of theatre conditions. The first of these experiments was reported in IP.<sup>2</sup> Skeptics are urged to carry out such tests and to report their findings for the benefit of the craft.

A discussion of screen masking from

<sup>2</sup> "Experiment in Screen Masking" in IP for December, 1947, p. 25.

the psychological point of view suggests a number of allied topics. Brief mention will be made of those holding special interest for projectionists.

The interception of projector light beams by valances or tormentors which hang a trifle too low is a common source of annoyance. The flickering spot or strip of light on the hanging seems to be more distracting to patrons than the shadow cast upon the top edge of the screen. More often than not, this fault is invisible from the projection room, hence the projectionist should observe the valances from the orchestra while

flashes of blank light are projected.

Elaborate chandeliers and proscenium decorations should also be revamped if they dip into the beams from any of the projectors. Judging from the presence of such defects in many "de luxe" houses, the appreciation of projection matters by theatre designers apparently has scarcely attained the kindergarten stage.

Brightly illuminated clocks, exit signs, sidelights, etc., at the front of the auditorium also militate against patron satisfaction. Never forget that the patron demands emotional experiences from the screen, and that in order to gain them

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he must really "lose himself" in the picture!

Clocks are never placed in the vicinity of the screen in well-appointed theatres: an acute consciousness of time is not conducive to the enjoyment of motion pictures. Exit signs should have a minimum of illumination—just enough to satisfy the law. Bright sidelights near the front of the auditorium should be extinguished along with the house lights when the show starts.

If the management refuses to permit the removal of an illuminated clock from the front wall of the auditorium, a 15- or 25-watt green bulb may be tried in the lighting socket. Green is far less distracting than red, white, yellow, or any other color.

Unfortunately, most municipal and state ordinances insist upon red exit signs. Now, red is associated with fire, blood, and danger; and because it is psychologically a powerful excitant, its use in the vicinity of the stage should be avoided. (This does not, of course, preclude the use of red decorative lighting on the stage during intermissions.)

Great improvements in projection lighting have led to the use of higher levels of general illumination in theatres during the presentation of pictures. Some general illumination is a requirement of law, and is desirable to assist patrons finding their way to and from seats. But excessive general illumination draws attention to the surroundings. The darkness, restful in itself, is not the least of the attractions of the theatre, as it in-

tensifies the dramatic effectiveness of the screen.

Motion picture psychology—the psychology of projection, in particular—is largely an unexplored universe of infinite possibilities. There is no medium of expression which has the vast scope of the screen, or which can even approach it in sheer emotional power. Nothing must be left undone, therefore, to enhance this basic appeal.

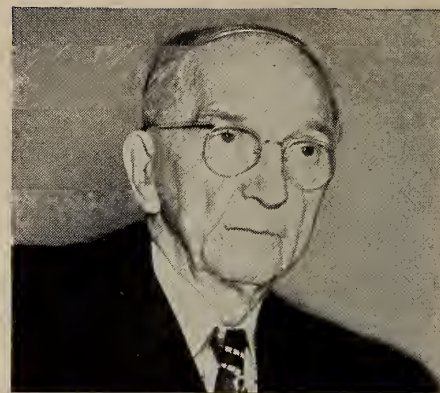
## MAN IN TROPICAL 'BOX'

(Continued from page 12)

paid usually in late January, just before the Chinese New Year.

The smaller houses usually have late afternoon and evening shows only, and the equipment and staff are naturally reduced accordingly. Two projectors and a staff of two projectionists and a rewinder is the normal arrangement.

Ambitious plans have been tabled for bigger and still more efficient cinemas to operate under the Shaw banner, cinemas that will rank high and compare favorably with the best in the world, cinemas where projectionists will be proud and happy to work. The plans cover many countries, but wherever the theatres may be located, the projectionists can rest assured that even if the audiences take their highly skilled labors for granted, their employers have schemes which will ensure that the task is made as congenial as possible. The machines used will be the best that money can buy, and environment will be as near ideal as it can be made; above all, they will be contented in their job, for their personal welfare



N. W. HUSTON—Owner, Liberty Theatre in Columbus and Maywood Theatre in Galena, Kans.—says:

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will never be overlooked nor taken for granted.

## Addendum

Evidence that Mr. Shaw is not merely an owner talking for publication but is sincerely interested in the welfare of his workers is contained in the following excerpt from "Projection in the Far East," by H. Campbell Bromley, which appeared in *IP* for June, 1948:

Also, the continuous or "repeater" program is quite unknown here. A regulation provides that theatres must be closed to the public for 20 minutes between performances for cleaning and ventilating. Apart from maintaining a high standard of hygiene, which is most important in a tropical country, this scheme also enables the patron to reserve his seat in advance and thus view the program undisturbed.

## Strict Operating Regulations

The theatres operate under strict regulations, very similar to those applying in Great Britain, which lay down very definite rules for the projectionist's health and safety. Adequate working space, efficient ventilation and direct access to the fresh air, a separate rewind room (also with access to the open air), a special room set aside for switchgear, and a comprehensive kit of fire-fighting apparatus are some of the things required before a license to open the theatre is granted.

In addition, the projectionist must not leave a projector while it is running, so there must always be at least two men on duty. From this it will be seen that the one-man crew is quite unknown here. The average crew consists of two qualified men and a trainee, but some of the larger theatres, which run four or five shows a day, will have up to five projectionists.

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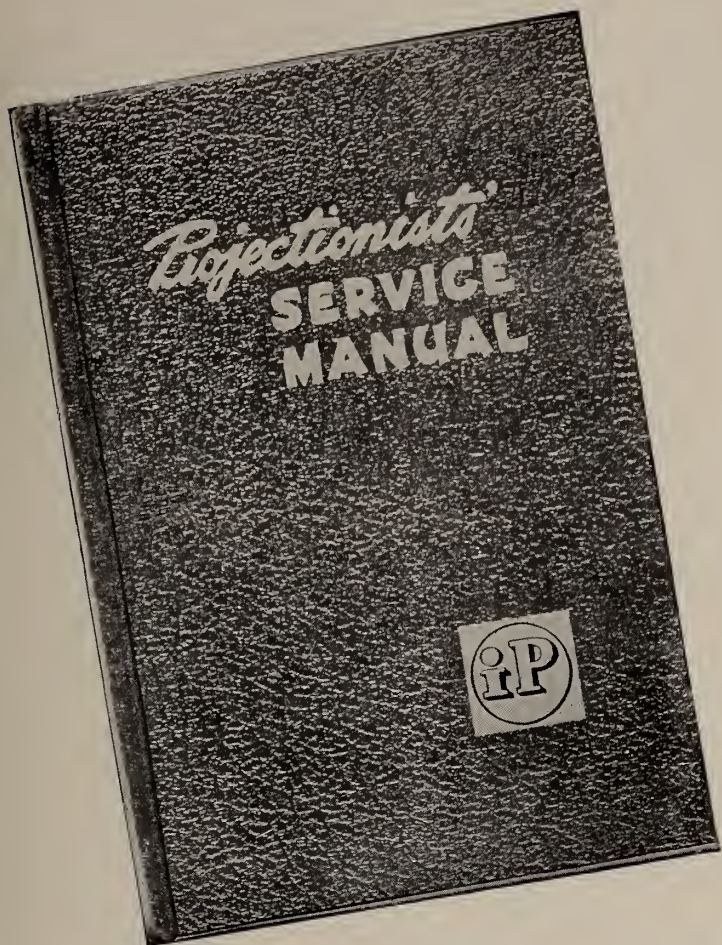
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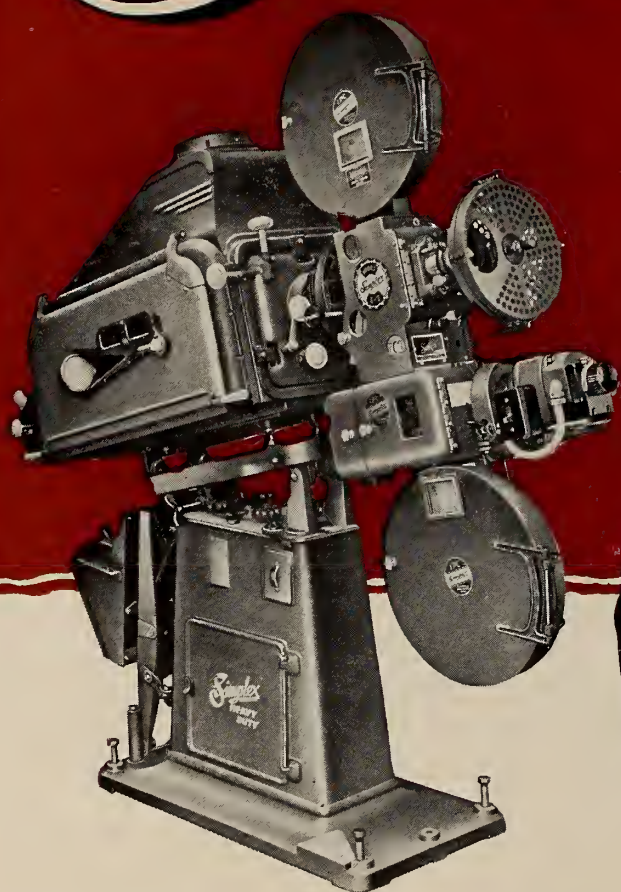
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JUN 27 1949

# INTERNATIONAL PROJECTIONIST

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HENRY B. SELLWOOD, *Editor*

Volume 24

JUNE 1949

Number 6

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## MONTHLY CHAT

**N**OT SO RANDOM THOUGHTS: When Tv penetrates into towns such as Syracuse, N. Y. (with other locales of 150,000 population that lie on the coaxial cable line due to debut within the next few months) the conclusion that there must be "something" there for the Tv boys is inescapable. Without regard to the *quality* of Tv images at present, one's thoughts inevitably hark back to the era when radio and dog tracks and Bingo were regarded as the prime opposition to the theatre box-office for the almighty dollar which keeps you, and you and us and a lot of other people in the exhibition field going along.

Nobody knows at the moment just how the theatre box-office will fare when 100 more Tv outlets are spotted in Syracuse, in Hartford, in Indianapolis, in Columbus, in Portland and in like towns. But that such Tv outlets are definitely opposition to the theatre box-office may not be reasonably denied.

We commend to our readers, and particularly to those forward-looking individuals who can see beyond their noses, the lead item of "In the Spotlight" on page 18 of this issue. Tv activity is certainly not going to sponge-up all the losses certain to be incurred by the theatre field as a result of the incursions of Tv within the next year, but it cannot fail to provide a cushion for the terrific impact which IP thinks Tv will exert against the motion picture theatre as presently constituted. Half a loaf . . .

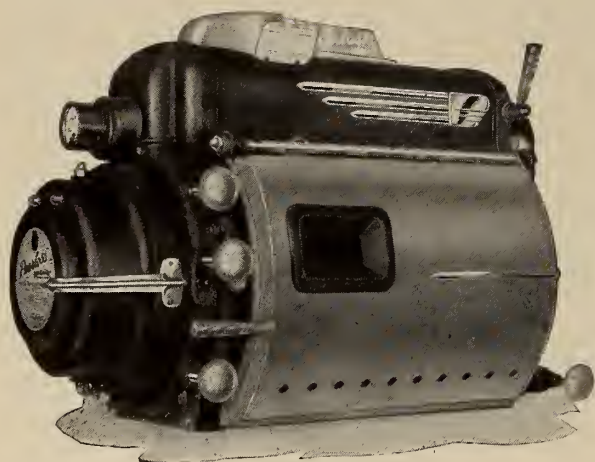
**A**RTICLES appearing in recent issues of IP have lately been the focal point of interest for motion picture technicians the world over—with particular emphasis upon those cinematicians in the British Isles, who not only are convinced that post-war British projectors are the "last word" in design and performance but also refuse to accept the IP conception of the ideal projection optical setup.

For all too long now projectionists have extended varying degrees of acceptance to those equipment units which, issued by a reputable manufacturer, were purchased upon the basis of *representation* rather than *performance* day-in and day-out. The time has long since passed when projectionists need accept any equipment other than on the basis of *detailed data*, supported by impartial performance records, of not only what but *how*; in other words, how does a given unit get that way.

IP has ever sought to be provocative in terms of providing food for thought, as opposed to the mere lading-out of data which is more or less the sugar-coating on fundamentals. The hackles rising on the neck of our British and other contemporaries merely serves to prove that IP still is in there serving up those data which best serve to advance the interests of the art and the craft.

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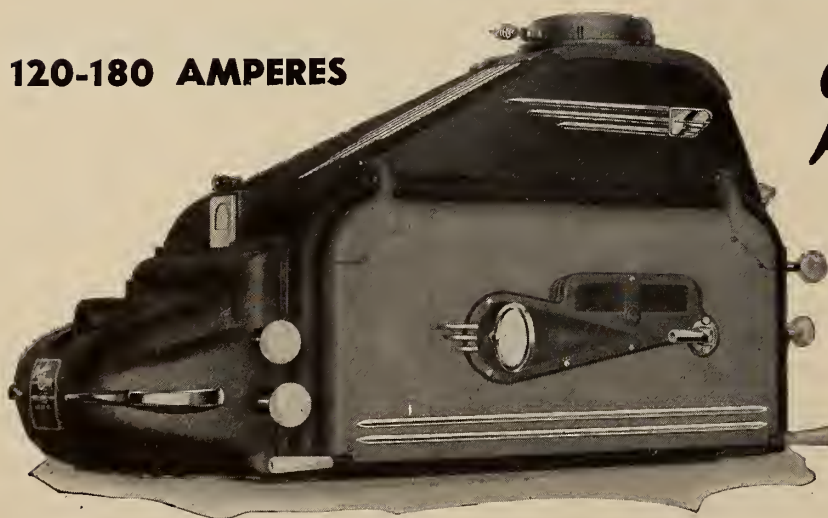
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# Distortion Factors in Sound Reproduction

**F**AR more anxiety is occasioned in projection rooms by *sound distortion* than by complete outages of sound. As sound troubles go, a total loss of sound is comparatively definitive: a cursory inspection of the system usually reveals the cause at once. Moreover, the better amplifiers are provided with emergency circuits which enable the projectionist to trace the trouble at his convenience.

Not so with "bad sound." The amplifier still works—nothing has failed completely—yet the system is definitely not functioning as it should. Particularly exasperating are those cases of distortion so slight that they are noticed only in the relative quiet of the theatre.

The difference between good and poor sound quality is often obscure and incapable of exact description. We notice such effects as "fluttery" sound, "hollow," "tubby," "harsh," and "noisy" sound and speak of all of them as "distorted." Obviously, a whole world of phenomena is included under this heading.

## Sound and Hearing

Sound may exist without anyone hearing it. There are sounds too low-pitched to hear, and sounds too high-pitched to hear. A "silent" dog whistle is a case in point. The human ear hears nothing when such a whistle is blown, but the canine ear, being sensitive to certain sounds we describe as "supersonic," responds to the whistle.

Sound, we know, is nothing but a succession of pressure waves in a medium of some kind—usually air. The velocity of sound in air is approximately 1,100 feet

By ROBERT A. MITCHELL

per second. The greater the pressure-amplitude of the waves, the louder the sound. Volume, therefore, is a function of the energy of the waves. The volume of sounds is most conveniently measured in decibels, or sensation-units, a logarithmic system familiar to all projectionists.

The distinction between *tones* and *noises* is very important. When sound waves beat against our eardrums irregularly we hear a *noise*; but when the dominant wave-pattern in a train of waves recurs at regular intervals, we hear a *tone*. *Periodicity*, then, is the difference between tones and most noises.

Tones (and quasi-tonal noises) possess the property of "pitch," a direct result of the frequency at which the wave-patterns repeat. High-pitched tones result from rapid vibrations (high-frequency waves); low-pitched tones result from slow vibrations (low-frequency waves). Because the velocity of sound in any specified medium is independent of frequency, high-frequency sounds have shorter wavelengths than low-frequency ones.

The frequency of tones is measured in complete cycles per second (c.p.s.), and it is customary to speak of a complete cycle of sound as a "double vibration." The conventional abbreviation d.v. means "double vibrations per second."

Sounds lower than 20 d.v. are called *subsonic* because they fall below the range of the human ear. The upper limit of hearing varies considerably among

different individuals. As an average, however, we set 20,000 d.v. as the highest pitched sound that can be heard: sounds of greater frequency than this fall within the *supersonic* range. (Most young children are able to hear 30,000 d.v. easily; very few elderly people can hear above 10,000 d.v.)

The average listener, therefore, can hear only those sounds between 20 and 20,000 d.v. (easy figures to remember), but strong subsonic sounds may be felt as a rumble, while intense supersonic sounds produce nervous irritation and a sensation of warmth in the ears.

## Frequency Range Data

The standard of musical pitch is the note designated as "middle C." This note is ordinarily assigned a frequency of 256 d.v., though "international concert pitch" is a trifle higher. Now, any two notes whose frequencies are in the ratio 1:2 or 2:1 are said to be separated by an *octave*. The standard piano keyboard has a range of  $8\frac{1}{4}$  octaves. The C an octave above middle C accordingly vibrates 512 times per second, and the C an octave below middle C 128 times per second. The highest note on a piano (four C's above middle C) has a frequency of 4,096 d.v.

It has been known for many centuries that some combinations of tones are much more harmonious than others. Any three notes whose frequencies stand in the simple ratio 4:5:6 form what musicians call a "major chord." If we play *do*, *mi*, *so* on a piano or organ, using middle C (or any higher C) for *do*, we can readily appreciate the warm, harmonious nature

of the C-Major triad. On the other hand, if we play *do, mi, so*, using for *do* any of the three C's *below middle C*, we shall hear a rather confused jumble of sound instead of a pleasing chord.

The chord is the same because the vibration ratios are still 4:5:6, so we wonder why distortion should appear in the bass. It would appear that the human ear is unable to judge the *exact* pitch of very low notes. All musical compositions from the most complex symphonies and "tone poems" to the most elementary popular ballads have considerably fewer sustained chords in the bass than in the treble. Simple "doubling in octaves" is the most common way of enriching the low bass.

### Theatre Systems Weak on L-F

The best theatre sound systems have a reasonably uniform, or "flat," frequency-response range of from 100 to 4,000 d.v., and they also reproduce with more or less fidelity the frequencies from 40 to 100 d.v. and from 4,000 to 9,000 d.v. The maximum range of soundfilm reproduction is accordingly 40 to 9,000 d.v. When we stop to consider that the highest note that the average person can detect is only about an octave above 9,000 d.v., and that the lowest audible sound is only an octave below 40 d.v., we should have few complaints regarding the over-all frequency range of modern sound systems. There is room for improvement only on the low-frequency end.

The lowest musical note of definite pitch is found in the *diapason* "stop" of the largest pipe organs. It has a frequency of only 16 d.v., and since this is below the limit of distinct audibility, it is *felt* as a rumble coming through the floor of the building, rather than *heard*. No theatre sound system can reproduce this tone, for to do so (assuming that it could be recorded) would require giant speakers of such power as to cause the floor and walls of the theatre to vibrate strongly and thus impart a pulsating sensation to the audience.

Thunder and earthquake noises also contain definite tones of subsonic frequencies, and the failure of theatre sound systems to recreate these sounds realistically is familiar to all who have ever heard thunderstorms or earthquakes. Thus the need for improvement on the low-frequency end of sound reproduction.

The highest note on the standard piano keyboard, as before stated, is 4,096 d.v. Some pipe organs go as high as 8,192 d.v. in the stop called *flute celestes* (but no actual flute can play a note higher than 2,304 d.v.). "Juke boxes" are often arranged to cut off all frequencies above 4,000 d.v. to eliminate unpleasant needle scratch, but phonographs designed for high-fidelity reproduction of

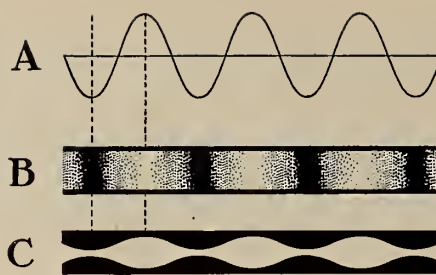


FIG. 1. Variable-density (B) and variable-area (C) soundtrack records corresponding to the sine-wave oscilloscopic graph of a "pure" tone (A).

the finest orchestral music in the home are capable of giving good response up to 10,000 d.v. (The writer holds that a cutoff at about 8,000 d.v. does not injure musical reproduction, and that a smart record company will one day produce a superlong-playing record revolving at 20 r.p.m.) Radio programs relayed *via* network hookups cut off a little above 6,000 d.v.

### Frequency Distortion

The first theatre sound systems were considered excellent if they reproduced (after a fashion) the frequencies from 100 to 5,000 d.v. Contrast this with the modern frequency range! Moreover, a high percentage of distortion was present in the output of the older systems—soundheads, amplifiers, and speakers all contributing.

One particularly annoying type of distortion was the over-amplification of certain frequencies and the attenuation of others. This is called *frequency distortion*, which means that the response curve is not flat but rises and falls in an irregular way as we pass from the lowest frequencies to the highest.

Poorly designed speaker units can ruin sound quality by introducing frequency distortion. No "off-make" speaker should ever be purchased for use in a motion picture theatre until the projectionist has examined and approved the response data obtained by energizing the speaker with a level input signal covering the entire frequency spectrum from 30 to 10,000 d.v. Low- and high-frequency units should provide satisfactory response characteristics over that part of the frequency spectrum which each is intended to cover, and generous allowance made for overlap of the frequency bands.

Frequency distortion may also arise from magnetically saturated or otherwise defective transformer cores. Amplifiers employing transformer-coupling throughout are always suspect. The remedy? Replace obsolete equipments with units of modern design. It is truly astonishing how many old-fashioned sound systems still are in use. Indeed, hardly a day passes when a sound service man somewhere in the U.S.A. does not

write "quality limited by equipment" in a service report.

A rough estimate of frequency distortion may be made by simply listening to the loudness of the various frequencies *via* a multi-frequency test reel. (A more accurate method will be discussed shortly.) With ordinary recordings frequency distortion is evidenced by the occasional occurrence of unduly sharp or boomy sounds, and, when due to speaker resonance, by a peculiar *timbre* of the sound quality ("tubby," "wooden," "metallic," or "hollow").

### Tone Color, or Timbre

Tone quality or *timbre*, together with volume and pitch, is one of the important characteristics of sounds. *Timbre* enables us to recognize voices and to distinguish different musical instruments by listening. Thus the sound of a flute may be told from that of a cornet even when playing the same note. The tonal brilliance and range of an orchestral pipe organ is due to the characteristic qualities of the various stops.

What factor in sound waves is responsible for tone quality? The simplest sound wave consists of pressure variations which, when plotted graphically (or when their electrical equivalents are supplied to an oscilloscope), describe a *sine wave*—the record of a *pure tone*.

A pure tone, even though the simplest possible, is a really extraordinary sound. It is quite characterless. Now, nothing in nature ever produces a pure tone, so it is only by striking a carefully constructed tuning fork with a felt-covered hammer, or by feeding sinusoidal current into a loudspeaker, that we can obtain a pure tone free from the elements which cause *timbre*.

How does a pure tone sound? It may be imperfectly described as a "hollow hum." Strike a large bell with the fist. When the sharper tones have all nearly faded away, bring the ear close to the bell. The "hum tone" of the bell, a pure tone, will then be heard.

Part A of Fig. 1 represents an oscilloscopic record of a pure tone—a sine wave. B illustrates a variable-density soundtrack record of the pure tone in A, while C shows a corresponding variable-area soundtrack. Soundtracks of pure tones of various frequencies are encountered in test films.

### Tones Above the Fundamental

All musical tones and sounds of definite pitch consist of periodic vibrations. Every such tone has an underlying pure tone, the frequency of which establishes the pitch; but the pure *fundamental tone* is seldom heard as such in voices and musical instruments. Instead, our ears hear a modified tone, the resultant of a number of combined pure tones, *those higher than the fundamental providing*

the characteristic tone quality of the sound.

The tones above the fundamental in any sound are called *partials*, or *overtones*. Most overtones have frequencies which are 2, 3, 4, 5, 6, 7, etc., times the frequency of the fundamental (that is to say, they are 2, 3, 4, etc., full octaves above the fundamental), and when this is the case they are called *harmonics*. An overtone having twice the frequency of the fundamental is called the "second harmonic"; one having three times the fundamental frequency, the "third harmonic," etc., the fundamental, itself, being thought of as the "first harmonic." Nevertheless, not all overtones bear a harmonic relationship to the fundamental.

Figure 2 shows the graphs of two pure tones of equal amplitude, but one of the tones has exactly *twice* the frequency of the other. When these are combined to form a compound tone having a definite quality, the tone of lower frequency is the *fundamental*, and that of higher frequency is the *overtone*. These two tones are shown combined in four different ways, depending on the phase relationship between the fundamental and the harmonic overtone; but even though the records of the four resultant compound tones *look different, they sound the same*. Phase difference, therefore, does not affect quality; a fortunate fact, forasmuch as electrical circuits often cause a shift of phase.

The compound tone created by combining a strong "second harmonic" with the fundamental tone, as in Fig. 2, is the rich, mellow voice of the organ's *viol d'amour*.

Not all compound tones are formed so

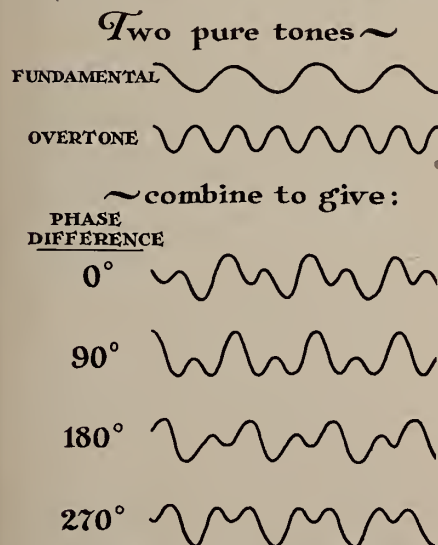


FIG. 2. The combining of two "pure" tones to give a compound tone possessing a characteristic tonal quality. Even though the four resultant tones have a different appearance, due to differences in phase, they sound the same because the ear takes no account of phase difference. The tone is that of the *viol d'amour* stop of an organ.

simply. Interference beats, "disturbed harmonics," etc., all play a part in the overtone patterns of many highly individualized tones. Major-chord overtones impart a sturdy fullness to a tone, while faint minor-chord overtones result in a pensive, *mysterioso* tone. In addition to the presence of overtones, musical sounds are sometimes further modified by the *tremolo*, a kind of wavering effect.

Figure 3 represents oscillographic records of several characteristic compound tones. All of these are of the same pitch (same frequency of the fundamental), five complete cycles of sound being illustrated in each case. Let us briefly analyze these sounds.

### Characteristic Compound Tones

The tone of the violin contains a strong second harmonic, a somewhat weaker third harmonic, and a number of fainter harmonics up to the twelfth. The best violins produce fewer harmonics, and are hence less "harsh" than the cheaper instruments. The tone of the flute is very nearly a pure tone, but a weak second harmonic perceptibly modifies the sound quality.

The fundamental of the clarinet is modified by numerous moderately strong overtones, notably the eighth, ninth, and tenth harmonics. The oboe is unusual in that the fundamental is weaker than many of the overtones. This state of affairs also obtains with the *hautboy* stop of the organ and with all other instruments producing reedy, oriental tones.

The sound of a bell has a weak fundamental modified by a multiplicity of dissonant, clashing overtones, very few of which are in harmony with the fundamental. When the sound of a distant churchbell meets our ears, we hear not the fundamental, but only the strongest of the overtones. The "pitch" of such a bell is ordinarily two or three octaves above the fundamental hum tone. Cymbals and Chinese gongs are so dissonant that it is indeed difficult to assign any definite pitch to them.

The four vowel sounds pictured warrant special attention. The fundamental frequencies of the female voice range from about 180 d.v. to 300 d.v.; of the male voice, from 100 d.v. to 200 d.v. If a sound system cuts off at about 300 d.v., we can hear reproductions of the human voice readily enough, but only as boomy, rumbling sounds. Hardly a single word could be understood. This is because articulation depends upon the overtones, not the fundamentals. Now the overtones in speech extend up to 4,000 d.v.; the sibilants and other transient talking noises may go even higher. At any rate, it may safely be said that sound systems must have a uniform frequency response from 100 to 4,000 d.v. in order to reproduce speech in its natural quality.

The timbre of voice tones is varied

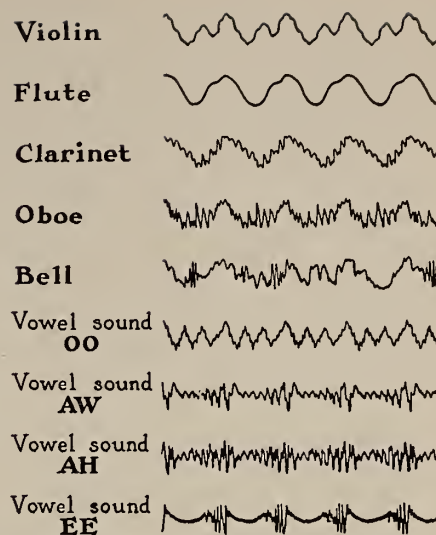


FIG. 3. Oscillographic records of several highly characteristic sounds. Five complete sounds (double variations) of the fundamental tone are shown for each of these sounds.

in enunciation by altering the shape of the oral cavity and by changing the relative strength of the fundamental emitted by the vocal cords. As many as 20 overtones have been detected in the human voice, and of these some are harmonics and some are not.

### Distinguishing Different Sounds

Many of the characteristic sounds at the beginning and end of speech and musical tones are mere noises called *transients*. The initial *p* and the final *t* in the word "projectionist" are transients. They have no definite pitch. The striking of the bars of a xylophone and the plucking of the strings of a guitar are musical transients. Additional transients are sometimes given to notes played on the organ by the device called *Chinese blocks*.

It may be wondered how two or more notes from different sources may be distinguished when they are sounded together. This is sometimes difficult, particularly when the tones of the different instruments have the same pitch; but two important factors assist the ear to disentangle two superposed tones:

First, the overtones from any one source are usually fainter than the fundamental (but not always), hence any discrepancy in the subconsciously presupposed overtone intensities is immediately interpreted as sound from more than one source. Second, two musical instruments can seldom be made to begin playing at *exactly* the same moment and to maintain the same sound intensity relative to each other throughout the period of sounding the note.

An outstanding exception is the organ which, after all, is an orchestra of many instruments played on a keyboard by one person. When two or more stops are

coupled, the tones usually begin and end at the same instant and maintain the same volume relative to each other all the time they are "speaking." The ear is thus deceived—especially when the notes do not differ in fundamental pitch by more than an octave—and a new compound tone, different in quality from any of the compound tones which compose it, is heard.

The number, pitch, and relative intensity of the various individual pure tones which go to make up a compound tone may be ascertained from oscillographic records or variable-area soundtracks by Fourier's analysis. The work is so difficult, however, that wave-analyzing machines which mechanically perform the necessary integrations are often used. The results of such analyses are valuable to designers of electric organs, in which complex pipe-organ and other instrumental tones are imitated by electrically generating and combining all the necessary pure tones in the correct degrees of intensity.

### Non-Linear Distortion

It can now be appreciated that any sound amplifier which introduces spurious frequencies into the sound changes the quality of the recorded sound. This most serious type of distortion is termed *non-linear distortion* because it is due to a non-linear, or non-proportional, relation between signal and response. It may arise from electrical, optical, or mechanical causes.

An oscilloscope is used for the scientific determination of non-linear response in theatre sound systems. Test films or disc records of pure tones at different frequencies are played, and the spurious frequencies become visible as a distortion of the sine wave on the cathode-ray tube.

*Any departure from the sine-wave form indicates that two or more pure tones are superimposed.*

Ordinary listening will detect non-linear distortion as a "harsh," "shrill," "raspy," "mushy" or other irritatingly unnatural quality of the reproduced sound. As a rule, this type of distortion is most pronounced at high volume levels and in sound of moderately high pitch. In many cases it is caused by nothing more serious than a defective amplifier tube.

Among other factors affecting sound quality are the directional characteristics of the speakers (high-frequency speakers, especially), the natural resonance and reverberation of the auditorium, extraneous noises in the sound (hums, squeals, thumps, clicks, and hisses), and a fluttery movement of the film or disc record.

[To be Continued]

## Nylon Gears on the RCA '400' 16-mm Unit

EVER since the introduction in 1931 of the first 16-mm projector to successfully employ a photographic sound track (the PG-38) RCA has been diligently seeking to effect an improvement in the projector gear train. It is obvious, therefore, that the decision to use nylon gears in its current Model 400 series of 16-mm projectors was not made on the spur of the moment.

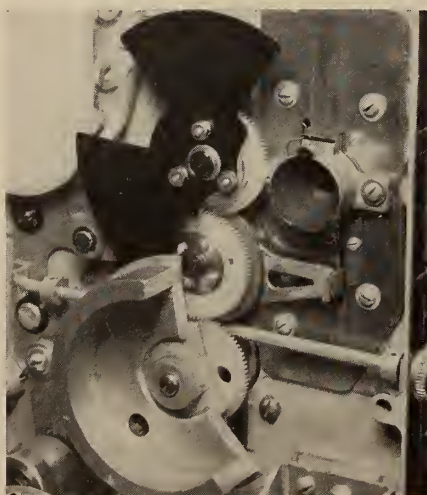
The matter of obtaining a uniform supply of precision cut gears have the necessary close tolerances, tooth forms, etc., for this exacting service has been a general problem over the years. While the drawings for these gears have always been the same, individual suppliers of fabricated steel and laminated phenolic gears have always tended toward a certain amount of compromise. This presented a new problem of gear supply with each manufacturer who, of course, was greatly influenced by the type of fabricating machinery and tools in his plant, his particular manufacturing techniques, supply of labor and its degree of skill.

In order to strike at the root of this problem, the idea of a molded gear often presented itself to the minds of RCA engineers. But for the lack of a suitable material, this idea might have been adopted years ago.

### Rigorous Tests Passed Easily

With the availability of nylon plastics materials, the molded gear idea seemed closer to realization, thus an experimental set of gears was cut from nylon rod stock and placed on life test. When after 1000 hours of continuous normal use these gears came through with flying colors, an accelerated test under excess load was made which firmly convinced RCA of the practicability of nylon for this purpose.

Typical nylon gear train as utilized in the RCA 16-mm '400' series projectors.



On the accelerated test, the gears ran well beyond their expected life before showing signs of wear and continued performing satisfactorily beyond this point. The gears ran silently, smoothly, without lubrication, and without attention. Moreover, it was found that gear center distances and other pertinent tolerances were not nearly as critical as in the case of fabricated gears. This allowed ready assembly in the factory and replacement in the field without critical adjustment which would otherwise result in "whine" when fabricated gears were used.

### Various Advantages Cited

The problem of a uniform supply of gears was therefore solved when the gear molds were ordered. The further advantage of a cost reduction of 50% or more as compared with other fabricated gears was also realized. Since it is known that molded gears have a tougher outer skin than gears cut from rod, it is fully expected that even better service will be obtained than from the gears cut from rod stock.

The daily accumulation of data on the new train of gears encourages engineers to say "Long life to nylon."

## Is Aural Acuity Diminishing?

The results of the survey conducted some time ago as to fidelity preferences was very interesting. It seems amazing that people should prefer imperfect reproduction, and thus miss much of the true quality of music.

Since its inception more than 25 years ago, radio broadcasting has come to such a point that many people do their musical listening almost entirely through it. Thus they learn music not as it really is, but as an essentially imperfect instrument reproduces it.

No popular-priced sets have fidelity much better than 100-8000 c.p.s. and very few are better than 200-5000. Thus when people are confronted with a system with a range of 50-10,000 c.p.s. or better, they are not familiar with the new sensation, and prefer the reproduction to which their ears have become accustomed.

This situation may mean that aural discrimination is becoming less acute, perhaps with respect to such factors as harmonic distortion as well as fidelity. Consider also that the people tested were adults who had begun to feel the influence of the radio only relatively late in life.

What about those of the present generation who have received practically all of their aural entertainment from radios and phonographs of decidedly doubtful quality, turned up far beyond the distortion point? What about television which is bringing people even more in contact with the dubious quality of electronic sound? Is the radio ruining our ears?—AUDIO ENGINEERING.



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# Addenda: 'Matched' Projector Optics

The wealth of articles anent projection optics appearing in recent issues of *IP* has attracted world-wide attention within cinematographic technical circles. Certainly not the least articulate is the estimable R. H. Cricks, Technical Editor of "Ideal Kinema" (London), whose observations are appended hereto.

By R. H. CRICKS

**A**N illuminated object upon which a camera is focused is reflecting light in all directions, and the bigger the lens the more of this light it will collect. Is this still true of a projection lens? It remains true only so long as the lens is not picking up all the light passing through the film.

Consider Fig. 1: obviously the smaller lens is not picking up all the light in the beam from the mirror, consequently any increase in lens aperture will increase the amount of light reaching the screen. If on the other hand the lens were of larger diameter, as shown in dotted lines, it would be picking up the whole of the directly transmitted beam, and any further increase in diameter would, on the face of it, result in passing no more light. This may not be strictly true, but for the moment we will accept it.

## Focal Length or Working Distance

Let us next turn to the arc mirror. By analogy with the lens the mirror may be given an  $F$  value, which is frequently calculated as the working distance  $W_1$  divided by the diameter (Fig. 1). But obviously it is more correctly expressed as  $W_2 : D$ . Naturally, we should not speak of focal length, as in the case of a lens, because the mirror never works at infinity; *working distance* is the correct term.

[NOTE: Mr. Mitchell is in complete accord with Mr. Cricks on this point, and, in fact, holds that Mr. Cricks has expressed the matter in substantially more accurate form than he did.]

The facile argument commonly used is that a mirror of  $F:2$  matches a lens of  $F:2$ , and that we then secure maximum efficiency. Is this correct?

Geometry proves that this is perfectly true for the center of the gate aperture. But, equally, Fig. 1 proves that it is far

falling off of illumination at the edges and corners of the screen, or as it is properly termed, the *vignetting* effect.

This would seem to be the case even if we assumed that the projector aperture were illuminated evenly. But in point of fact it is not. An interesting experiment is to place a torch bulb in front of a mirror, in the position of the positive crater, and view the mirror through an aperture placed at the working distance.

It will be found that when viewed centrally the whole of the mirror will be "flushed," or filled with light, except, perhaps, for the extreme edges; but a half-inch movement of the eye will cause the image of the lamp filament to move in the opposite direction on the mirror, with the effect that one side of the mirror will appear unilluminated.

What does this prove? It proves that the edges of the picture are illuminated chiefly by rays of light from the edges of the mirror. If, therefore, our lens aperture is too small to pick up all these marginal rays, the effect of vignetting will be considerably greater than Fig. 1 would suggest.

## The American Viewpoint

Articles have appeared recently in the American press (meaning *IP*, of course—Ed.) seeking to apply orthodox optical formulae to the solution of this problem. The results obtained from these formulae indicate the entire impossibility of meeting the requirements.

One factor of which these formulae take no account is the phenomenon known as *eclipsing*. If one looks centrally at the rear glass of a lens, one can see the whole of the front glass, or on older lenses, of the stop. But if one looks at it off-centre, part of the front glass—or again, of the stop—is hidden by the mount. It follows that the lens will pass more light from the central part of the aperture than from the edges.

From these arguments it would seem logical to suggest that projection lenses should no longer be rated in  $F$  values. What matters is: (1) the actual diameter of the back glass; (2) the back focal distance  $B$  in Fig. 2; (3) the ability of the lens to pass the beam of light from a mirror of given  $F$  value when the back glass is completely filled,

None of these factors can, as far as my limited optical knowledge goes, be ascertained by orthodox optical formulae. A basis of calculation is indicated in Fig. 2, which is an enlargement of the right-hand section of Fig. 1.

The lens must, according to our present requirements, be capable of collecting the whole of the light contained in a cone whose apex is not the surface of the film but the crossover point of the marginal rays behind the film.

If we approximate our film frame diagonal to 1 inch, the distance of this point behind the film will be equal to  $F$  inches,  $F$  being the speed of the mirror. If  $B$  is the back focus of the lens, the distance from the apex of the cone to the lens will be  $B + F$  inches. The necessary diameter  $L$  of the lens will be:

$$L = \frac{B + F}{F}$$

If we assume a mirror having a speed of  $F:2$  and a lens with a back focus of  $1\frac{1}{2}$  inches, we find that the necessary diameter of the back glass of the lens will be:

$$\frac{1\frac{1}{4} + 2}{2} = 1\frac{5}{8} \text{ in.}$$

A few existing lenses may possibly meet this requirement, while the  $F:1.4$  lens, which is foreseen in this specification as a design of the future, should certainly do so, having a maximum back diameter of 3.15 inches.

In putting forth these views I am in no sense seeking to instruct opticians in their craft. All these factors are well known to optical computers. In spite of this, they—or should I say the publicity experts?—continue to rate lenses in  $F$  numbers, a characteristic which, as I have shown, has little or no bearing upon the suitability of a lens for a given optical system.

[NOTE: Mr. Mitchell is definitely not in agreement with the computations given by Mr. Cricks above, and he also holds that  $F$  numbers are absolutely necessary for geometric computations.—Ed.]

## Stray Light Losses

I have so far omitted yet another factor. I have assumed that all the light falling upon the film passes straight through it, as shown in the sketches. We all know this is not the case; if it were,

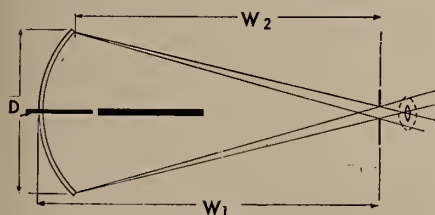


FIGURE 1

from being the case when we have to deal with an aperture whose diagonal is about one inch. The effect of using a lens of an  $F$  value the same or less than the mirror must be to accentuate the

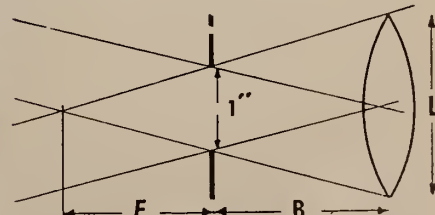


FIGURE 2

then one could look sideways at the celluloid side of the film in the projector gate and see the whole of the frame black. The bright spot of light which we actually see is due to the dispersion of light,

chiefly by the silver particles of the optical image.

It is obviously not practicable to collect much, if any, of this stray light. But if it were, would it be desirable? I rather think not.

The incident light is dispersed more by the particles of silver—that is, by the blacks of the image—than by clear film. The effect of stray light is therefore to degrade the blacks of the picture and to

reduce the contrast. If, therefore, the lens were to pick up much of this stray light, it would produce a brighter picture at the expense of contrast. To carry the argument a step farther, it is logical to suggest that the bigger the lens aperture the lower the contrast in the projected image.

[NOTE: Mr. Mitchell does not agree with this contention on the basis that the

center of a lens does not collect dispersed light.—Ed.]

Another factor of a purely mechanical nature which I have omitted is the smaller depth of focus of a wide-aperture lens. The effect of this is that film buckle becomes more noticeable with a wide-aperture lens, and if such lenses are to be used, the avoidance of film buckle by the use of a curved gate is essential.

## 'Stilb' and Other Irritants Reduced to Americanese

The use of designations other than the familiar "footcandle" and "footlambert" and "lumen" evidently is a source of minor irritation to not a few IP readers, according to several recent communications bearing on this topic. IP has long recognized this feeling on the part of its readers, but occasionally it slips up and fails to provide the proper factor for conversion into good old Americanese.

A case in point was the use (sans conversion factor) in our April issue (p. 29) of the term "stilb" in an abstract of an SMPE paper issuing from the Philips Lamp Works in Holland. Correspondents suggest that if IP just *must* use

such terms as "stilb" and other unfamiliar designations, the proper conversion factor be given.

No sooner suggested than done; and as a well-rounded service of a more or less permanent nature IP publishes the accompanying inclusive table of conversion factors which not only deals with "stilb" but with all other lighting unit designations.

In future IP will exercise the utmost care to supply *via* a footnote the proper conversion factor; but if human frailty should prevail over the best of intention, it may not be said that nobody suggested permanent retention of the accompanying table.

## CONVERSION FACTORS FOR LIGHTING UNITS

### ILLUMINATION

1 lumen = 1/650 lightwatt

1 lumen-hour = 60 lumen-minutes

1 footcandle = 1 lumen/sq.ft.

1 watt-second =  $10^7$  ergs

1 phot = 1 lumen/sq.cm

1 lux = 1 lumen/sq.M = 1 meter-candle

Number of Multiplied by Equals Number of	FOOT- CANDLES	LUX	PHOT	MILLIPHOT
Footcandles .....	1	0.0929	929	0.929
Lux .....	10.76	1	10,000	10
Phot .....	0.00108	0.0001	1	0.001
Milliphot .....	1.076	0.1	1,000	1

### BRIGHTNESS

1 stilb = 1 candle/sq.cm

1 apostilb (international) = 0.1 millilambert = 1 blondel

1 apostilb (German Hefner) = 0.9 millilambert

Number of Multiplied by Equals No. of	FOOT- LAMBERT	LAMBERT	MILLI- LAMBERT	CANDLE/ SQ.IN.	CANDLE/ SQ.FT.	STILB
Footlambert ..	1	929	0.929	452	3.142	2,919
Lambert .....	0.00108	1	0.001	0.487	0.0034	3.142
Millilambert ..	1.076	1,000	1	487	3.381	3,142
candle/sq.in..	0.00221	2.054	0.00205	1	0.00694	6.45
candle/sq.ft..	0.3183	295.7	0.2957	144	1	929
Stilb.....	0.00034	0.3183	0.00032	0.155	0.00108	1

### INTENSITY

1 international candle = 1 bougie decimale = 1.11 Hefner Kerze

## Summarization of Findings

We may summarize this finding as follows: (1) The  $F$  number of the mir-

ror must be calculated not as  $\frac{W_1}{D}$  but

as  $\frac{W_2}{D}$ ; (2) a lens of the same  $F$  value

will give the maximum brightness at the centre of the image, but serious vignetting at the edges; (3) optimum results—brightness and edge-to-center ratio—will be secured by a lens having a back glass of diameter  $L$ , as shown in Fig. 2, and capable of transmitting the whole of the cone of light received from the gate aperture, whose apex is the cross-over point of the marginal rays behind the film; (4) a lens of still larger diameter will pick up no more directly transmitted light and, by picking up stray light, will merely degrade the projected image.

[Immediately following are Mr. Mitchell's observations on the comment by Mr. Cricks, with particular reference to the general formula advocated by the former.]

## By ROBERT A. MITCHELL

AT the outset I must disagree with Mr. Cricks's disparagement of the  $F$ -number system of rating the "speeds" of projector lenses. It is true that this rating system is geometric rather than optical, but for this very reason it must be retained. Optical matching is basically a matter of geometry; and such optical refinements tending toward the attainment of maximum picture brightness, optimum image contrast, and uniformity of illumination must conform to the basic geometric requirements.

It is curious that Mr. Cricks should develop his soundest arguments along geometric lines only to brush them aside with the statement: "In spite of this, they—or should I say the publicity experts?—continue to rate lenses in  $F$ -numbers—a characteristic which, as I have shown, has little or no bearing on the suitability of a lens for a given optical system." Still more curiously, Mr. Cricks utilizes the utterly false  $F$ -number ratings of condensing elements (mir-

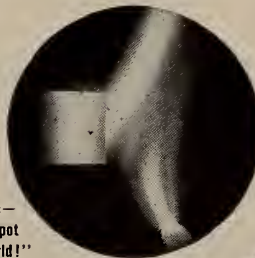
(Continued on page 29)

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FIG. 1—Experimental lamp with probes for measuring the net arc voltage, without water cooling.



FIG. 2—Experimental lamp with water jackets and probes.

# The Effect of Carbon Cooling on High Current Arcs<sup>†</sup>

By WOLFGANG FINKELNBURG

Research and Development Laboratories, Fort Belvoir, Virginia

**W**ATER-COOLING of the positive as well as the negative carbon of high-intensity carbon arcs has proved to be of great advantage in cases where highest brightness, and therefore highest current density, is desired. A systematic study of the influence of water cooling on the properties of the arc and its mechanism therefore seemed desirable and has been carried out at the Engineer Research and Development Laboratories by the author with the help of L. R. Noffsinger and C. Orr, using an excellent new super high-intensity experimental carbon of 11-mm diameter (No. 070) manufactured for this service by the National Carbon Co.

## Method of Measuring

The measurements were made with a Mole-Richardson lamp (Figs. 1-3) which has a carbon angle of 52 degrees. The lamp was designed for automatic feeding but for these studies it was changed to hand-controlled feeding.

The carbons were cooled by copper jackets through which water was circulated, and which enclosed the carbons

near their burning ends (Fig. 2). The carbons protruded from these water jackets, through holes only slightly larger than the carbons, a distance of approximately 7 mm for the positive, and approximately 20 mm for the negative carbon.

Water jackets in the form of semi-circular jaws, pressed from both sides against the carbons, would offer certain technical advantages; however, they were not used for this investigation, because of the difficulty of manufacture.

For comparison of measurements of water cooling with forced-air cooling, a copper-finned head (Fig. 3) was used. This head was cooled with compressed air and served to prove that identical effects could be achieved by cooling the positive carbon with compressed air as with water. For the essential set of

measurements, 9-mm copper-coated negative carbons were used with the 11-mm positive carbons; the arc length of 18 mm was kept constant by observing a greatly magnified image of the arc, with marks for the desired position of the carbon tips.

A pointer, attached to the rear end of the positive carbon, permitted its length to be measured on a mm scale during the operation of the arc. Thus, with a stop watch, the rate of consumption of the positive carbon could be measured. This was done as soon as a stationary state of operation had been reached for each respective current.

The gross voltage of the arc, including the voltage drop in the carbon tips, was measured by connecting the voltmeter across the carbons at the water-cooled heads for the cooled arc, and at the negative clamp and the positive brush for the uncooled arc. In order to measure the net arc voltage, two carbon probes (Figs. 1 through 3) could be made to touch the carbon tips near the burning ends by means of a magnetic relay. The crater depth was measured by means of a special gauge, while the crater diameter was measured with a standard caliper. The crater brightness was measured by projecting the crater image with a lens of known aperture on a photosensitive cell.

While the current and arc length were kept constant with utmost care, voltage, crater brightness, and positive-carbon consumption were measured simultaneously and recorded as averaged over 2-minute runs. After each run the crater

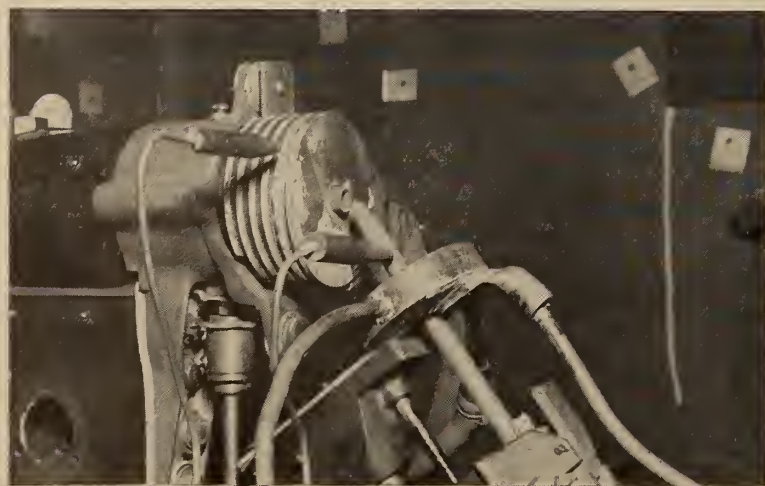
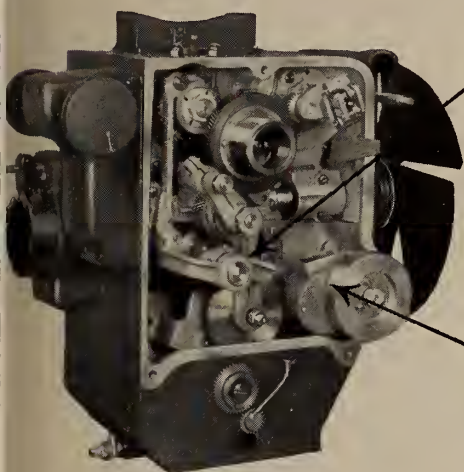


FIGURE 3

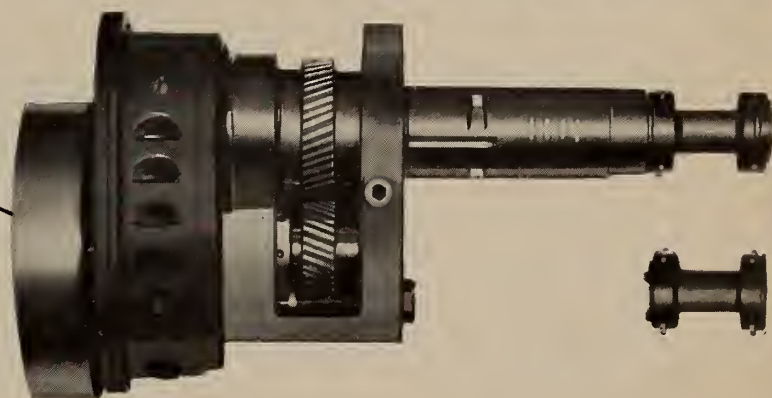
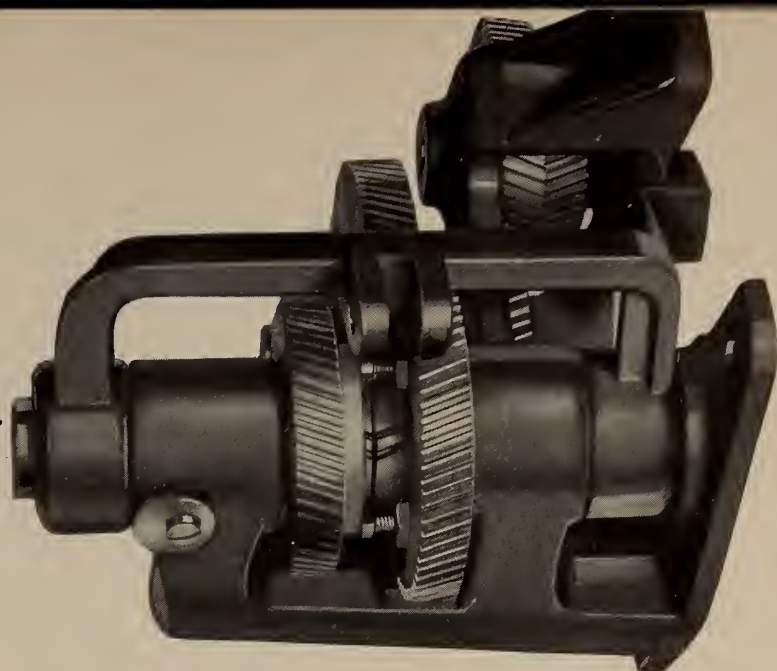
Experimental lamp with probes and copper-finned head for forced-air cooling.

<sup>†</sup> J. Soc. Mot. Pict. Eng., April, 1949, p. 407.

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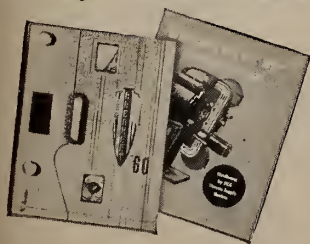


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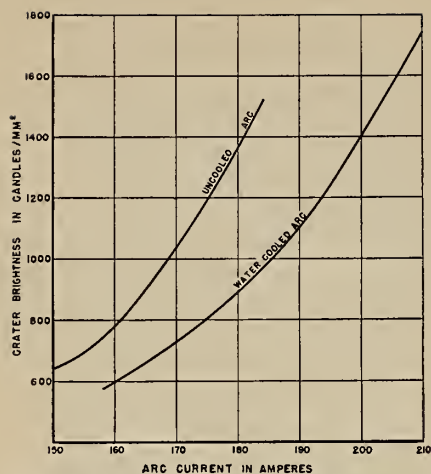
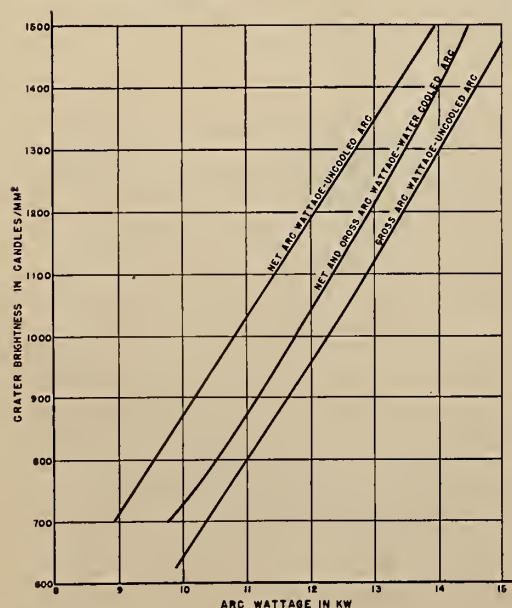


FIG. 4—Comparison of crater brightness of cooled and uncooled arcs at equal currents.

depth was measured. During the first tests, the crater diameter also was measured, but this was discontinued since it remained constant at 11 mm for the water-cooled arc, and was from 0.1 to 0.2 mm smaller for the uncooled arc.

#### General Properties of Cooled and Uncooled Arcs

Comparison of arcs without carbon cooling, with water-cooling of both carbons and with exclusive cooling of either the positive or the negative carbon, revealed that water-cooling increased the steadiness of the arc and of its radiation considerably. Cooling of the negative carbon alone had no effect other than that of steadying the arc; while cooling of the positive carbon increased, to a great extent, not only the steadiness of the arc, but also changed important properties of the arc, such as arc voltage and positive-carbon consumption. Furthermore, water-cooled carbons, especially if designed for this kind of operation, reached a much higher brightness than uncooled ones.



With the best uncooled 11-mm carbons, sputtering and hissing of the arc began at a brightness of approximately 1500 candles per sq. mm; while steady operation of the same carbons, when water-cooled, was possible up to a brightness of 1850 candles per sq. mm. From all measurements the conclusion seems to be inevitable that cooled positive carbons behave quite differently in the high-current carbon arc than do uncooled ones, in which each part is heated to a very high temperature before the arc reaches it. A detailed study of the changes in the carbon core resulting from this heating is under way.

A quantitative comparison of the properties of the high-current carbon arc with cooled and uncooled 070 carbons is presented in Figs. 4 through 12, in which averaged results of a large number of measurements, carried out with many samples of 070 carbons, are plotted.

Figure 4 shows one of the most unexpected effects of cooling the positive carbons: for all currents the net arc voltage (as measured with the probes between the carbon tips) is considerably lower than without cooling, no matter whether the negative carbon is cooled or not. As the arc stream is independent of the positive carbon, it seems safe to conclude that this decrease of the arc voltage is caused by a decrease of the anode drop, and this conclusion is in agreement with earlier investigations.

According to the theory of arc radiation, developed in connection with the anode-drop work, a decrease of the anode drop always causes a decrease of the crater brightness. Fig. 5 proves that water-cooling of the positive carbon actually does cause a considerable reduction of the crater brightness at the same current.

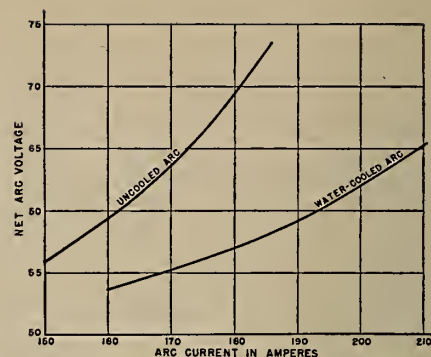


FIG. 5—Decrease of net arc voltage caused by cooling of positive carbon (same arc length).

In Fig. 6, the crater brightness is plotted against the arc wattage. The middle curve refers to the water-cooled arc (where the difference between the net arc wattage and the gross arc wattage falls within the limits of accuracy of our measurements because the carbon protrusions are short), while the upper and lower curves are plotted against the net arc wattage and the gross wattage of the uncooled arc.

For a given net arc wattage the uncooled arc gives a higher brightness than the water-cooled arc; while a given gross wattage, actually dissipated in the arc and the carbons from the negative clamp to the positive brush, results in a higher brightness for the water-cooled arc.

#### Light Efficiency Data

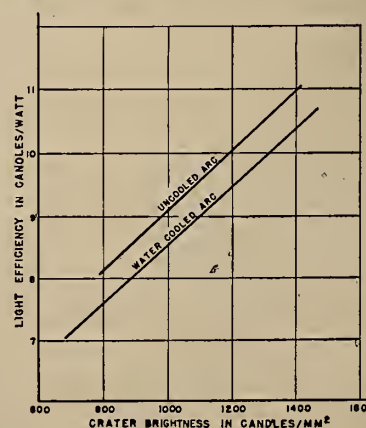
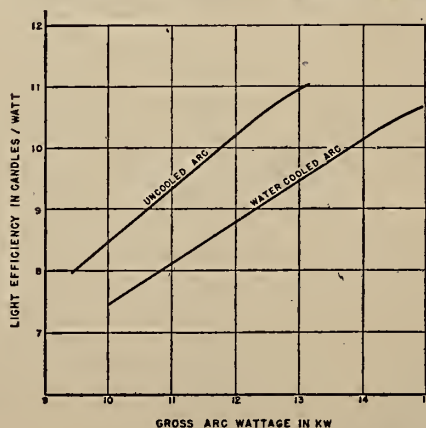
Relative to the total light efficiency, measured for convenience in candles per watt gross arc wattage, the uncooled arc is always superior to the water-cooled arc, as may be seen from Figs. 7 and 8, in which the efficiency in candles per watt is plotted against the gross arc wattage and brightness, respectively.

With reference to the gross arc watt-

FIG. 6 (left): Comparison of crater brightness of cooled and uncooled arcs for equal net and gross arc wattages.

FIG. 7 (center): Comparison of light efficiencies of cooled and uncooled arcs for equal gross arc wattages.

FIG. 8 (right): Comparison of light efficiencies of cooled and uncooled arcs for equal crater brightness.



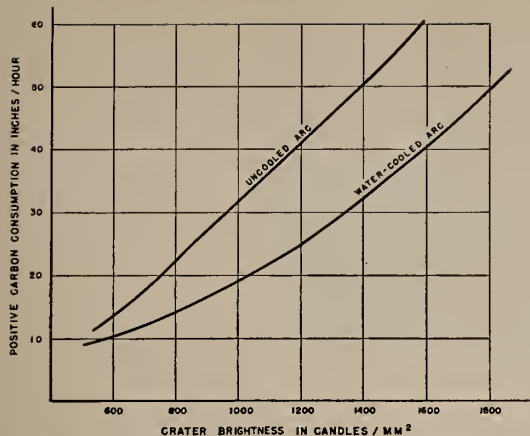


FIG. 9—Comparison of positive-carbon consumption of cooled and uncooled arcs for equal crater brightness.

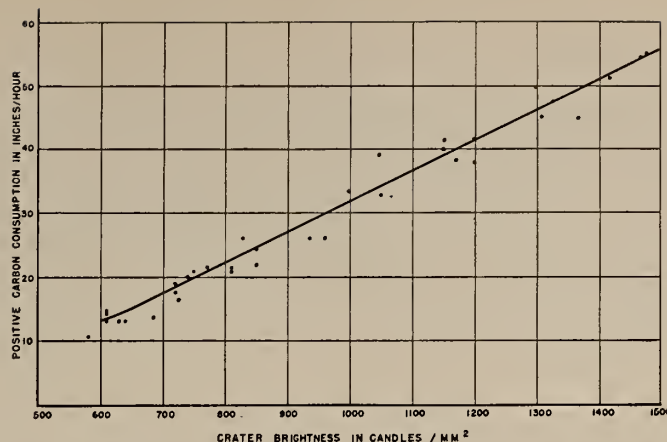


FIG. 10—Increase of positive-carbon consumption with crater brightness.

age, the difference is about 12%, while with reference to the same crater brightness it is only approximately 6%. This slightly lower light efficiency of the water-cooled arc probably is caused by the fact that the water carries away part

of the energy transferred to the positive carbon by the arc.

The most important feature of the water-cooled arc, next to its superior steadiness at highest brightness, is its low positive-carbon consumption as seen

from Fig. 9, where consumption is plotted against crater brightness.

Compared with other carbons, the consumption of the experimental carbon No. 070 is very low even without water.—(Continued on page 28)



To the Editor of IP:

Though belated, we trust that this comment will lose none of its emphasis thereby. In your November 1948 issue there appeared an article "Safety Film: Projection Factors" which, under the subhead "Procedure Governs Results" on page 14, contains a statement which we consider erroneous. We quote: "Frequent adjustment of this splicer (the Griswold) is advisable because of the shear blade positioning."

This statement is, we think, very misleading because it does not explain *why* the positioning of the shear blade requires frequent adjustment, nor does it state just what adjustments should be made.

#### Field Adjustments vs. Warranty

As the manufacturer of this splicer, we stress the fact that adjustments of *any* nature are unnecessary and should not be attempted in the field. These splicers are set up at the factory with special fixtures and aligning tools, not available on the outside, and an attempt at adjustment in the field will tend to throw the entire unit out of alignment.

As a matter of fact, adjustments such as you recommend would void the liberal guarantee anent performance which we extend for one year from the date of purchase.

GRISWOLD MACHINE WORKS

[The section in the article referred to was a bit misleading and might well have

been stated somewhat differently—simply a matter of interpretation. Instead of saying that when the center bar of the splicer becomes etched it will tend to wear the corners of the film, IP might have more accurately stated that such etching would tend to give an uneven scraping surface.

By "frequent adjustment," the phrase to which our correspondent especially objects, IP could have indicated that it was not so much the *positioning* of the shear blade but rather its *surface condition* which formed the basis of efficient performance. It might have been specifically stated that if the shear blade becomes etched, it should be either replaced or resurfaced to give a truly flat scraping surface.

As for the balance of the article relating to splicing technique, it is readily admitted that very few projectionists replace scraper blades after 25 scrapes; but IP still thinks the practice a good one for optimum results. After all, if IP doesn't shoot for the stars, it will be put in the position of tolerating, if not actually advocating, minimum rather than optimum standards.

In passing, it might be observed that when IP is read so assiduously and so much importance is attached to a single paragraph in a rather lengthy article, it is surprising that all enterprising manufacturers do not avail themselves of such tremendous reader interest.—Ed.

To the Editor of IP:

Could you tell me where I could get an outfit to use in lining up the optical system of the lamp-projector? I have read about dummy lenses and aligning rods but have been unable to locate any. I am advised to "see a dealer," but when

I see a dealer he knows from nothing about such items.

How about these film splicers utilizing heaters to aid in splicing the new safety film?

OLIVER K. BLAIN, Jackson, Mich.

[Aligning rods for the projection optical system are such a commonplace of the art that IP assumed that every dealer worthy of the name had such equipment. Inquiry reveals, however, that even the largest supply houses rely upon an eye-view and rule-of-thumb system for such alignment.

Failing to obtain such a rod from a supply house, it is almost certain that the service company field men could come up with such a tool.

Splicers with heating attachments, used mostly in studio and laboratory work, are unnecessary for the effective splicing of the new safety film. Detailed instructions on this procedure have appeared in IP.—Ed.]

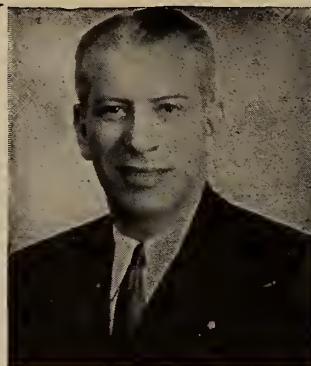
To the Editor of IP:

I have noticed in the technical literature several references to the Veri-Vision system of producing and showing stereoscopic motion pictures (Veri Vision Holdings, The Hague, Netherlands). The assertion is made that this system is the answer to "true" three-dimensional motion pictures. What's the answer on this?

RAY McALLISTER, Los Angeles, Calif.

[The answer is that the Veri-Vision system is just another variation of the conventional method of producing stereoscopic pictures in that it utilizes an analyzer (colored spectacles for each viewer) much in the same fashion as has been demonstrated numerous times in the past. The most notable stereoscopic pictures shown with the aid of an analyzer was the Audioscopes series produced by Jack Norling (Loucks & Norling Studios) of New York City.—Ed.]

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**W**E HAD occasion recently to examine both State and municipal laws relating to the projection of motion pictures in theatres. Oddly enough, we found that the emphasis in these regulations is placed upon the material used in the process rather than the degree of craftsmanship that is brought to bear upon the handling of these materials. Film and machinery are accorded precedence over craftsmanship, which is a combination of know-how and experience.

Our thinking along this line was crystallized by recent stories in the trade press to the effect that the introduction of the new tri-acetate film, the use of which is expanding rapidly, constitutes a valid basis for requesting a reduction in projection room manpower. We anticipated just such a reaction from penny-pinching exhibitors who for years have been more concerned with box-office intake rather than the very means which attracts that intake—namely, the projected image on the screen.

Noticeably lacking in the various regulations we examined is any reference to projectionist competency based upon experience. Moreover, we failed to find a single reference to the extremely high voltage utilized in modern projection practice. There are instances of record where panic has been induced among an audience confined in darkness within four walls wherein not a single frame of film was ignited. A simple film break which results in a blank screen has been known to occasion noticeable unrest, which is contagious among such an audience.

Of course, when theatre Tv comes into being, voltages will run to 60,000 and more, thus establishing a situation wherein consideration of a film fire will be relatively unimportant. Be that as it may, our advice at the moment, *with all the force at our command*, is that those progressive union leaders who are interested in protective legislation for their members immediately take stock of the present legislative status in their respective areas and move quickly and vigorously to have such laws require a proper recognition of the intricacies of the projection process. *No more vital task confronts the progressive union official today!* We invite those who desire more specific information on this topic to address this department directly.—H. S.

- The Rodger Young Auditorium in Los Angeles, Calif., was the scene of a testimonial dinner tendered recently to Dick Green, former IA official and a member of Locals 165 (Hollywood, Calif.) and 2 (Chicago Stagehands). Grant Johnson, president of Local 2 planed in from Chicago for the special purpose of presenting Dick with a gold life membership card in recognition of 40 years meritorious services rendered the Local.

Present at the dinner were many members of the IA official family, including Carl Cooper, 7th IA vice-president; Roy Brewer and Steve Newman, IA West Coast representatives, and Floyd Billingsley, 3rd IA vice-president and business manager for San Francisco Local 162. Officers and members of many nearby Locals came to do honor to one of the grand old-timers in the Alliance.

- Joe Cifre, member and former president of Boston Local 182, received the

"Great Heart Award" at a luncheon given in his honor by the Variety Club of New England. The luncheon, held on June 7 at the Copley Plaza Hotel in Boston, was attended by many industry

leaders. Joe was honored at a citation dinner last Fall for his work, while chief barker for Variety Tent No. 23 (New England), in raising more than a quarter of a million dollars for the Children's Cancer Research Foundation.

- We were happy to learn that our very good friend C. E. (Red) Rupard, former business manager for Dallas Local 249, is making steady progress in his recovery from an injury to his shoulder. Enforced idleness is not much to Red's liking and he is anxious to get back on the job.

- Stemming from the elections held last month, the Pennsylvania Labor Relations Board certified IA Local B-100 as collective bargaining agent for cashiers, doormen, ushers, cleaners, porters, and matrons employed in Philadelphia motion picture theatres. Paramount, Fox, and Warner theatres are directly affected by this certification.

- George Anderson, member of Milwaukee Local 164 for the past 30 years, and Mrs. Anderson celebrated their 25th wedding anniversary last month at the South Shore Yacht Club in Milwaukee. More than 150 friends, including the entire executive board of Local 164, helped to make this a gala event.

- Peter Benard, 69, member of Bridgeport Local 277 and vice-president of the Connecticut Federation of Labor, died at his home last month after a long ill-

## DICK GREEN AWARDED GOLD LIFE MEMBERSHIP CARD IN CHICAGO STAGEHAND LOCAL



Grant Johnson (center left), president of Chicago Stagehand Local 2 presents Dick Green with a gold life membership card in the Local. Shown above, on the extreme left, is Steve Newman, IA representative, and on the extreme right, Carl Cooper, 7th IA vice-president.

ness. A prominent figure in labor circles for the past 50 years, he helped organize the Bridgeport Local back in 1912 and served in an official capacity for many years. In April, 1948, Local 277 sponsored a testimonial dinner for Pete and presented him with a gold life membership card.

In memory of Pete's deep interest in educational opportunities for the girls and boys of Bridgeport, the Central Labor Union, of which he was president emeritus, and *The Herald*, local newspaper, have donated two scholarship funds of \$500 each to the University of Bridgeport and to the Fairfield (Conn.) University. These scholarships will be known as the Central Labor Union Peter Benard Memorial Fund and The Herald Peter Benard Memorial Scholarship—a fitting tribute to a man who devoted the greater part of his life to the betterment of his fellowmen.

Pete is survived by two sons and three daughters.

- By the time this issue goes to press Harvey O'Laughlin, past president of St. Louis Local 143, will have become a benedict. He was married on June 10 to Miss Helen Brown, who is prominent in St. Louis business circles. Our very best wishes go to the happy couple.

- *Correction:* On page 17 of last month's issue, we identified the man on the right-hand side of the picture appearing at the foot of column one as Tom Fitzgerald, when it should have been his brother, John, president of Cleveland Local 160. Tom, who is also a member of the Cleveland Local and secretary of the Local's Bowling League, did not appear in the photo.

- Recent out-of-town visitors to the offices of IP: Leo Moore, member of

#### GALA CELEBRATION MARKS 35TH ANNIVERSARY FOR LOCAL 323, SPRINGFIELD, ILL.



A dinner-dance at the Terra Plaza commemorated the 35th anniversary for Local 323, Springfield, Ill. Delicious food plus excellent music and a very fine floor show made the evening an enjoyable one. The showing of the IA Documentary Film was a highlight of the party. In addition to the officers and members of the Local, present at the affair were two of the original charter members—John P. Stutzman, retired, and Walter E. Bryner, of the Lincoln Theatre.

Hollywood Local 165, called prior to taking off for a three months' tour of England and the European continent. . . . A visit from S. N. Agarwal, head of Cine-fones, one of India's largest dealers in motion picture theatre equipment, was greatly enjoyed by the IP staff, who were much interested in Agarwal's account of present-day customs and conditions in India. . . . J. Gordon Jackson, member of Vancouver Local 348, and M. Karp, member of Toronto Local 173, were among our Canadian visitors. . . . From upstate New York came Richard L. Kowell, member of Syracuse Local 376, and Harry H. Lackey, acting business manager for Utica Local 337.

- Nate Golden, member of Cleveland Local 160 and chief of the Motion Picture Division of the U. S. Department of Commerce, left for Europe early this month as a member of the U. S. delegation at Annecy, France, to take part in the discussions relating to the reciprocal

trade agreements involving motion pictures and equipment. He will act as consultant and advisor to the negotiating committee on problems pertaining to the film industry.

At the conclusion of the conference, Nate and Mrs. Golden, who accompanied him on the trip, plan to visit Germany, France, Italy, etc., for the purpose of investigating conditions in important European motion picture centers.

- We are very sorry to learn of the serious illness of G. (Newt) Wallis, former president of Local 105, London, Ont., Canada. Having undergone several operations during the past year, Newt seemed to be well on the road to recovery when he suffered a relapse.

- Prominent in Masonic circles, Orville Langheinrich, member of Milwaukee Local 164, had a public installation recently when he was made the Eminent Commander of Henry L. Palmer Commandery No. 42, Knights Templar. The entire Local membership was invited to witness the ceremony.

- Charlie Vencill, secretary-treasurer of Los Angeles Local 150, has requested this department to inform IP readers who are contemplating a trip to the West Coast that prevailing conditions in Los Angeles and the vicinity do not allow for the employment of out-of-town projectionists. There is hardly sufficient work available for the members of Local 150, and the chances of any outsider getting a job out there are pretty slim, reports Vencill.

- Acting as business manager for two Vancouver, B. C. IA Local Unions—Projectionists' Local 348 and T-B Local 72 (cashiers, ushers, etc.)—proved too great a strain for Bob Foster who resigned as business manager of the projectionist

(Continued on page 26)

#### CALIFORNIA DISTRICT NO. 2 DELEGATES ENTERTAINED BY BAKERSFIELD LOCAL 215



Attending the recent meeting of California District No. 2 were representatives from Los Angeles L. 150; Hollywood L. 165; Bakersfield L. 215; San Diego L. 297; Santa Barbara L. 442; Santa Ana L. 504; Long Beach L. 521; San Bernardino L. 577; El Centro L. 656; Hollywood L. 659 (cameramen); Hollywood L. 683 (laboratory technicians); Hollywood L. 705 (costumers); Hollywood L. 706 (makeup artists); Ventura Co. L. 709; Hollywood L. 727 (utility workers); and Los Angeles L. 776, (film editors).

Among those shown in the group above are Carl Cooper, IA 7th vice-president; Roy Brewer, IA West Coast representative; Charlie Vencill, George Schaffer, Alonzo Bennett, Herb Aller, Walter McCormick, James Eddy, Louis Wutke, John Lehnars, and Billy Wise.

# Polarity is Strictly Relative

By A. BUCKLEY

**M**AGNETISM and electricity are so related that it is rarely possible to discuss one without some reference to the other. Polarity occurs in each subject: but whereas *N* and *S* poles are the terms used in magnetism to show where points of free polarity exist, *plus* and *minus* signs are used in electricity to indicate points of reference in connection with current movement.

In algebra,  $+$  and  $-$  signs are used in combination as additive and subtractive quantities, but they must be used in a correct sense. For instance, the expression  $-5$  oranges  $+$   $7$  oranges would be quite sensible, since the actual meaning would be  $+$   $2$  oranges. An expression such as  $-5$  oranges  $+$   $7$  bananas would, however, remain as such, for one cannot take away oranges from bananas.

Similarly, in all circumstances where positive ( $+$ ) and negative ( $-$ ), or *N* and *S* polarity signs, exist, it is necessary to indicate some reference point—that is, if the information is to be intelligible. A few observations relative to this topic will undoubtedly be of interest.

For the sake of convenience (if nothing else) it is usually accepted that where an air-gap exists in a magnetic circuit, the “lines of force” leave the *N* pole and, after passing through air, reenter the *S* pole: thus the lines are given some imaginary direction.

A perfect magnet—i.e., one which has no losses and no appreciable external field—may consist of a complete ring of hard magnetised steel (Fig. 1). According to the molecular theory of magnetism, the myriads of tiny magnets are arranged end to end and in perfect sequence, and since there is no break in the metal—no air-gap—these particles

form a closed ring and the external field of influence is almost non-existent.

If a saw-cut be made in such a ring, at any point, an air-gap will exist and a free intense magnetic field will be created at that position. Since the permeability of air is lower than that of steel, the field will occupy more space than it did when only steel was present (Fig. 2). Moreover, the ends of the ring will exhibit “free” polarity: one will be North, or *N*, and the other South, or *S*. If further saw-cuts be made at any points on the ring, “free” polarity will exist at each and every one.

Obviously, this could go on forever, or nearly so. The dominating fact in these experiments is that every small magnet has two points of reference—the North and the South poles.

If six small bar magnets be positioned as shown in Fig. 3, the magnetic fields will be complex and every magnet will exhibit “free” polarity. But if, as shown in Fig. 4, the magnets are placed end to end, then, apart from the extreme points of assembly, no “free” polarity will exist.

To prove that points of polarity are merely relative, refer to Fig. 1 where, assuming the direction of the magnetic field to be as shown, position *C* is South relative to position *B* and also to point *D*. Positive *B* is North relative to *C*, but South is relative to position *D*. The same thing happens in any closed magnetic ring, for from *any* point of reference on the magnet, relative positions may be either North or South—according to the direction.

Let us consider an interesting point

which has an exact counterpart in electrical circuitry. Referring again to Fig. 1, where point *A* at the top and point *B* at the bottom are the two positions under discussion. Assuming that the direction of the internal field is as shown, then position *B* will have North polarity and *A* South—if the *left* side of the ring be under consideration. But if we consider the *right* side of the ring, position *B* will be South relative to *A*.

## Graphical Distribution

In a simple bar magnet the intensity and distribution of the field can be shown graphically, as in Fig. 5. It will

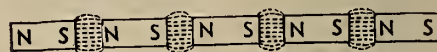


FIGURE 3

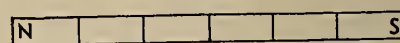


FIGURE 4

be noted that the center of the bar shows no “free” polarity. If the magnet be cut in half—exactly in the same way that the initial ring was cut—then “free”

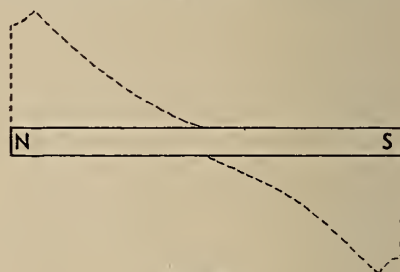


FIGURE 5

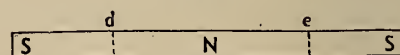


FIGURE 6

polarity will be present. Therefore, free polarity occurs *only* where an air-gap exists.

When a bar magnet is magnetized in such a way that the ends are of similar polarity and the center point is of an opposite sign, the magnet is said to possess “consequent poles.” Fig. 6 shows such a magnet. In any case of this type, two separate fields will exist, for the lines of force leaving the North pole must complete their paths through air to reenter the South poles. If such a magnet be cut at points *a* and *e*, “free” polarity will exist at these points, but the center section will still possess consequent poles. Supposing the magnet to be cut exactly in the center, then the two remaining sections will be ordinary bar magnets with their North poles opposite each other.

Having discussed some points in con-

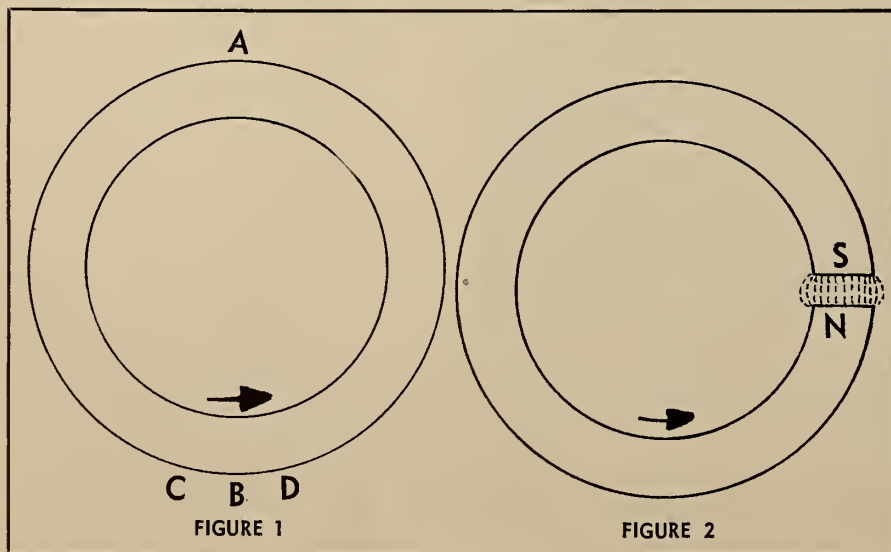


FIGURE 1

FIGURE 2

nection with magnetic properties and effects, let us examine several conditions relative to electrical circuits.

A simple circuit consists of a closed loop of wire which can be represented

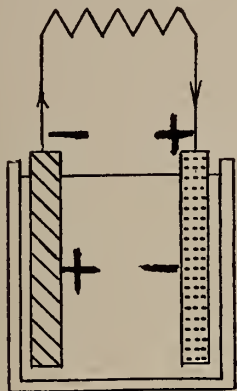


FIGURE 7

by Fig. 1. Its resemblance to the perfect magnet will be at once apparent. In such a loop of wire any current created will have the same value at every point, and the voltage difference between any two points of similar measurement will be the same.

Taking an experimental case (exactly as in the magnetic example) and assuming current direction to be as shown, point C will be negative to points B and D. Point D will be positive to points C and B; while point B will be positive to C and negative to D.

Bearing these points in mind, it will be seen that the terms "positive" and

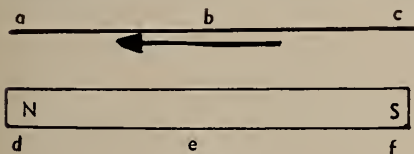


FIGURE 8

"negative" have no *real* meaning unless some point of reference is indicated, for *any* point can be either negative or positive.

Let us use a somewhat unusual slant, having a resemblance to an earlier magnetic example. Fig. 1 is now assumed to be a closed loop with points A and B equidistant from each other in both directions. Neglecting ohmic resistance and voltage drop, but taking current direction as shown, if we consider the *left* side of the loop, point B will be positive to point A. But if we consider the *right* side of the loop, point B will now be negative to point A.

#### Reference Point Essential

In a simple cell the terminals are marked + and -. The + terminal is positive and current is assumed to enter the cell at that point. Terminal - is negative and there the current leaves

the cell. *Inside* the cell, however, the terms are reversed, as shown in Fig. 7. It must be remembered that the same number of mobile electrons exists in all parts of a closed circuit, and that whether a simple cell or dynamo is considered, it merely constitutes an electron pump. Therefore, the terms "plus" and "minus" are really meaningless unless some point of reference is mentioned.

The similarity between electrical and magnetic circumstances is shown in Fig. 8. At point a the position is positive to points b and c. Similarly, the position a on the magnet is North to positions e and f. Point b on the electrical circuit is + to point c, but - to point a. Also, point e on the magnet is N to position f but S to point d. Therefore, a closed magnetic ring—or a bar magnet—has a similar counterpart in an electrical circuit.

In amplifier work the point of reference is usually the chassis, which is, in many cases, at earth potential. Thus, all voltages existing on the tube elements, or at any position in the circuit, are measured from this reference point. Anodes, screens and cathodes are positive with respect to the chassis, while grids are often negative when using directly-heated tube filaments.

#### Stream of Electrons

A mercury-arc rectifier is a fascinating instrument and lends itself well to the explanation of relative plus and minus signs. In connection with this device, a very able projectionist of many years standing once asked the writer from whence the negative point of the circuit really commenced. Being a spot question, it made the writer think very quickly, and of course it had to be explained that the negative point, or the positive one too, could be *anywhere* one wished.

Figure 9 shows the fundamental cir-

cuit of the mercury-arc rectifier. The motion of electrons is from the mercury pool to whichever anode is positive at any instant, through the transformer windings and load and via the smooth-

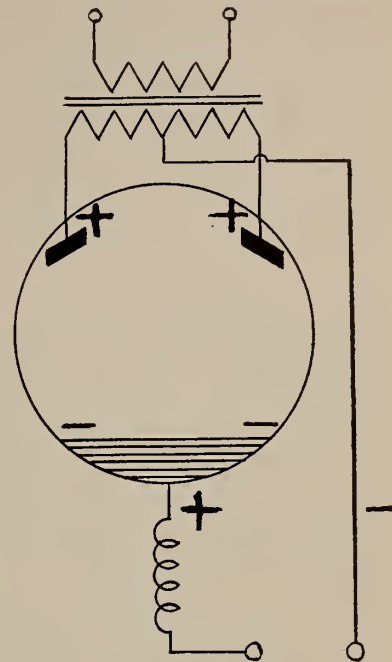


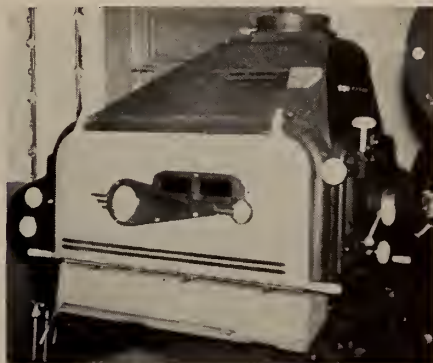
FIGURE 9

ing choke back to the mercury pool. Inside the glass bulb the cathode is the mercury pool which emits electrons to the anodes in turn: these are positive when conducting. Outside the tube the mercury pool is the positive terminal of the outfit and the connections to the center tap on the transformer are negative. Thus, we give further proof that signs are merely relative.

That's the important thing to remember: of, by and in themselves signs and symbols are almost wholly unimportant: they must be interpreted in terms of their relation to other signs and symbols.

#### Peerless Carbon Dispenser

The peerless Hy-Candescent carbon dispenser provides a dry, practical and really convenient storage cabinet for projector arc carbons. It attaches directly



Peerless Hy-Candescent carbon dispenser.

to the under side of the base plate of the Hy-Candescent lamphouse, with very little effort. Each carbon compartment accommodates one full package (50 pieces) of carbons. Loading is easily done, and the bottom of the compartment is so designed that one positive and one negative carbon is served at a time.

One end of the dispenser is provided with a metal fastener to which may be attached a hand wiper or a towel. This dispenser may be attached to all Hy-Candescent lamphouses that are installed on any type of Simplex pedestal.

#### New Motiograph In-Car Speaker

A new extremely lightweight in-car speaker, featuring great strength, attractive appearance, improved sound, long life and low maintenance cost, is announced by Motiograph. The round housing is in two

pieces of moulded plastic with a flexural strength of 10,000 pounds and a tensile strength of 9000 pounds per square inch, permitting unusually rough handling. The housing encloses a large five-inch weather-proofed speaker unit.

The speaker housing reportedly will withstand 100% humidity and 200-degree dry heat tests, the equivalent of three years' outdoor exposure, without warping, chipping, cracking or marring the finish. The housing is quickly disassembled by the simple removal of two special patented screws.

As an integral part of the shaft of the constant impedance volume control, the volume control knob cannot drop off and be lost. This knob, as well as the concession signal switch, are so inset in the side of the housing as to prevent damage should the speaker be dropped. The constant imped-

ance volume control permits precise adjustment of sound volume.

### Cautions on Tv Surveys

Interpreters of Tv research findings should be sensible and cautious about swallowing—hook, line and sinker—the results of surveys made of that medium thus far, Sidney Roslow, director of The Pulse, told the American Marketing Association recently. Pointing out that unwarranted generalizations have been frequently made, Roslow added:

"The questions dealing with Tv effects have usually come in the course of interviews dealing exhaustively with Tv. The phrasing of the question has been such as 'Since having a Tv set do you

go to the movies more often, less often, or about the same?' What answer could one expect?

"We have had the Tv set owner say to us that it's not Tv that keeps him away from the movies but rather is it the poor pictures being shown at the movies. So I find something on my Tv set."

### Optical Bulletin by U. S. Agency

Optical glass, an indispensable raw material for precision optical instruments, has been developed and manufactured by the National Bureau of Standards since World War I. Recently the Bureau published a description of the procedures it uses for the production of optical glass in its experimental glass plant. This publication, "Optical Glass at the National Bureau of Standards," is available from the U. S. Government Printing Office.

Included in the booklet are compositions, melting, molding procedures, and annealing schedules for many types of optical glass. Sections are devoted to such topics as properties of optical glass, melting pots, batch materials, the melting process, preparing rough glass for molding, molding, inspection of molds, and annealing.

Although details of production with which an experienced glass manufacturer is familiar have been largely omitted, sufficient information is given to enable one experienced in the trade to enter the optical glass field.

NBS Circular 469, *Optical Glass at the National Bureau of Standards*, 14 double-column pages, 12 figures, five tables, obtainable from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 15c a copy. Remittances from foreign countries must be made in U. S. exchange and must include an additional 1/3 of the publication price to cover mailing costs.

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PROTECTING THE THEATRE—FIRST PLACE IN ENTERTAINMENT

### BOOK REVIEW

THE MOTION PICTURE THEATRE—PLANNING AND UPKEEP. A compendium of papers presented at the SMPE Theatre Engineering Conference. 428 pages, profusely illustrated, buckram. \$5. SMPE, 342 Madison Ave., N. Y. City.

The first comprehensive theatre engineering handbook, detailing the physical requirements of the motion picture theatre from the blueprint to curtain time and beyond, has just been published by the SMPE.

This generously illustrated, 428-page volume, entitled "The Motion Picture Theatre—Planning and Upkeep," presents in non-technical language a wealth of data on numerous phases of theatre design, construction modernization, and maintenance under eight major headings: Physical Construction, Auditorium Design, Ventilating and Air Conditioning, Acoustics, Lighting, Floor Coverings, Promotional Display, and Television.

The book, priced at \$5, is now available through the SMPE offices, 342 Madison Avenue, N. Y. City.



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## Harry Schiffman, Student of Labor Relations

NOT a little of the credit for the recent successful conclusion of negotiations which awarded jurisdiction over all mechanical and machine shop work in 10 major Hollywood studios to the IA is being deposited in the lap of Harry Schiffman, business manager for IA Cinetechnicians Local 789. Members of 789 are precision machinists and toolmakers whose function is to keep precision equipment in the studios in top operating condition.

Harry Schiffman is interesting to IP readers not only because he is a brother craftsman but also because he always kept his chin up and eyes and ears open to obtain the basic facts anent smart labor relations. So good is Harry in this field that his projection work has been on the strictly limited level.

Migrating from Cleveland to Hollywood in 1928, Harry found the projection employment situation in the studios a bit on the rugged side. Necessity dictated that he shift from one classification to another on the various lots, and in



•  
Harry  
Schiffman,  
business  
manager for  
IA Cinetechnicians  
Local 789.  
•

this fashion he was able to form a comprehensive picture of the Hollywood labor situation that was later to stand both himself and the IA in very good stead indeed.

In 1936 the IA obtained their first inclusive closed-shop contract in the studios, and Harry got back to his first love—projection. He was instrumental in obtaining the separate charter for Local 165, studio projectionists, of which he still is a member. In fact, the first name on that charter is Harry Schiffman.

### Bang-up Job on Machinists

During all the turmoil engendered in the Hollywood studios in 1945 by Sorrell's anti-IA Conference of Studio Unions, Schiffman was plugging away at the assignment to bring all the master machinists under the IA banner. That Harry did a masterful job is evidenced by the contract recently signed with the IA, no less than by the fact that Harry was practically stolen away from his projection work to become business manager for Local 789.

In Harry's job there isn't any too much time for hobbying around, but there is

one Schiffman hobby that gets attention—steering young Gary Schiffman's career as quarterback for Hamilton High School. Gary, now 16, is merely following in his father's footsteps, for Harry did quite a bit of pigskin-toting back in his Ohio days.

Harry Schiffman is much more than a union member and leader; he is always digging to find out what makes unions tick and particularly what their status is with respect to their employers. No degree in labor relations from a univer-

sity has Harry, but his practical store of such knowledge places him away out front of many a product of the ivied walls.

## Silver Vital in Photography

Eighteen tons of silver are used annually in putting pictures in newspapers and in illustrating books and magazines. That's as much of the metal as goes into the minting of more than 5 million dimes. But for print shop use it is spread mighty thin and must be more than "mint pure."

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makes possible a high intensity arc spotlight without the use of heavy rotating equipment.

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covered that silver nitrate is sensitive to light. That Dark Ages discovery slumbered for centuries, little noted, until it finally became the basic chemical principle upon which photography is built.

#### Silver Particles on the Job 4 Times

As a result, silver, as particles suspended in gelatin one-thousandth inch thick, is on the job four times in the course of helping to illustrate a newspaper. It records an

image on a negative film when a camera shutter clicks. It transfers that image as a positive onto paper—slick prints for publishing use. It records again on film in the photo-engraving shop, and finally on the copper plate which becomes a “half-tone cut”—ready for printers’ ink.

Nth degree purity is a must; but even if a theoretical 100% purity could be attained, some silver, from certain mining areas, would not do because through all refining processes it remains faintly radioactive. Press photographers and photoengravers cannot use even the tiniest trace of atomic energy.

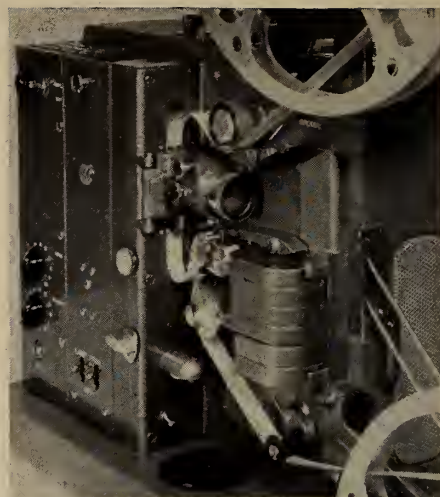
### RCA ‘400 Junior’ Single-Case 16-mm Soundfilm Projector

A new *single-case* addition to the “400” series of RCA 16-mm sound motion picture projectors, known as the “400 Junior,” will be available in June at a suggested retail price of \$442.50. Compact design was achieved through an ingenious rearrangement of the 8-inch speaker and its incorporation in the lid of the case, which doubles as the speaker baffle. The speaker may be placed adjacent to the projector, or it can be placed next to the screen through the use of a 50-foot cable. The lid provides adequate baffle for full tonal range.

#### Many Operational Features

A unique feature of the “400 Junior” is the use of high-speed gears made of nylon, which extensive laboratory tests have shown to be quieter in operation and to give longer life than steel or fibre gears. Auxiliary equipment, in addition to the speaker, includes a 15-foot power cord, a reel accommodating 400 feet of film, a 50-foot speaker cable with plug, upper and lower reel arms, an extra exciter lamp, oilcan, box fuses, lens tissue, aperture brush, and a threading diagram.

Among the operational features is constant silent speeds. Selective speed change is accomplished mechanically, so that there is no change in blower speed, making for unusually cool running. A second feature is “theatrical type” framing, which adjusts the cooling at either



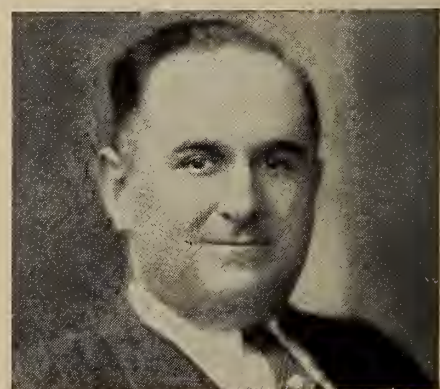
Closeup of the RCA ‘400’ Junior 16-mm projector, without lid which serves as baffle for 8-inch speaker.

sound or position of the film in the gate without moving the aperture plate.

#### Visual, Sound Projection Data

An embossed guide-line for easy threading is incorporated in the projector, together with a wide-swing film gate, and cushion-action sprocket shoes. Rewinding of film is automatic, requiring no changing of reels. Even tension takeup is maintained regardless of the amount of film on the reel. The powerful 4-stage amplifier delivers a full 10-watt output with less than 5% distortion throughout the 16-mm recording range.

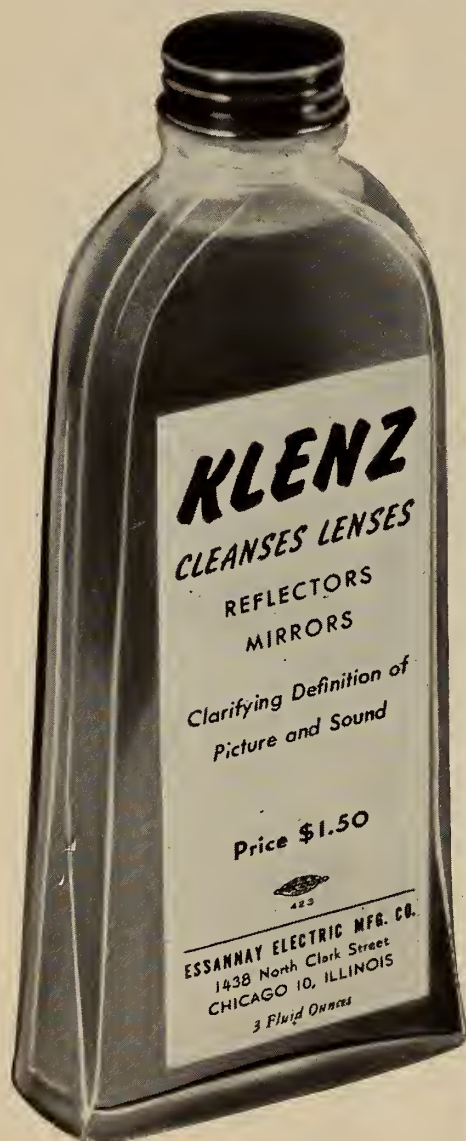
Die-casting of the main frame, backplate, and lamphouse permits a high degree of accuracy in assembly and close control of fabrication.



LOU PADOLF—Manager, Virginia Theatre, Parkersburg, W. Va.—writes:

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For perfect rewinding on 2000-foot reels.

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## Wenzel Sound Systems Available

Wenzel Projector Co. has resumed the manufacture of complete sound reproducing systems which had been discontinued through the war years. The new line provides soundheads for all types and sizes of theatres.

Complete units now supplied by Wenzel include amplifiers, speaker systems, soundheads, upper and lower magazines, rear-shutter projectors, and the de-luxe WB-600 or the 5-point pedestals. Full details available from Wenzel at 2505 South State St., Chicago.

## Robust Paramount Earnings in 1949

Paramount Pictures earned \$24,357,102 for the fiscal year ending Jan. 1 last, as compared with \$31,440,477 for the previous year. While the Par net is down some \$7 millions from the preceding year, and considerably below the record 1946 figure, it is considerably higher than the nets earned during the war years and before.

Barney Balaban, Par president, reiterated his previously expressed contention that Tv "may turn out to be our companion rather than our antagonist." An aggregate amount of \$1,253,235 was paid by Par and its subsidiaries to officers and directors during the year. Balaban received \$156,000, plus benefits under a pension trust plan of \$37,687.

## Tv 'Freeze' to Last Through Summer

The present "freeze" on Tv will last throughout the Summer, FCC Chairman Coy announced. He estimated that within five years 40 to 50% of American homes would have Tv sets, with from 600 to 800 stations on the air with the UHF band in use.

## FP Canadian '48 Profits Increase

Famous Players Canadian in 1948 showed a net profit of \$3,286,264, equal to \$1.89 per common share, according to the Paramount subsidiary's annual report. Figures compare with \$3,156,446 profits in 1947, equal to \$1.81 per common share.

J. J. Fitzgibbons, FPC president, said gross boxoffice receipts were up last year, but net operating income was trimmed by higher costs. He expects a good year in 1949.

## Exposure Frame of 1/1500 Second

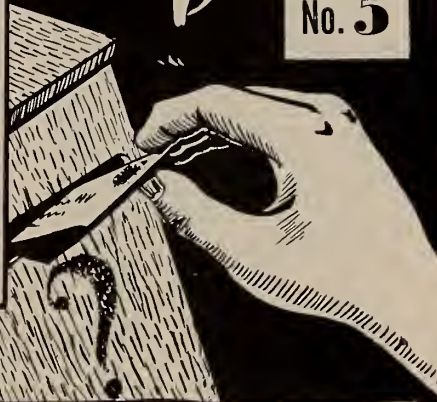
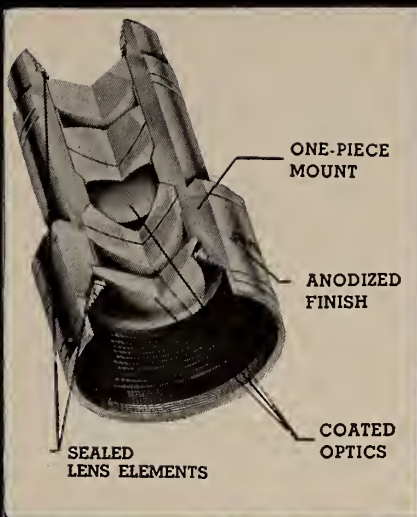
The distance of the 3-kilometer speed course (approx. 1 7/8 miles) laid out at Rodgers Dry Lake, Muroc, Calif., was surveyed by the U. S. Coast and Geodetic Survey to an accuracy of one part in 600,000, each end of the course being indicated by bench marks set in concrete. Three inches behind these bench marks are concrete bases, three feet high, used as rigid mounts for high-speed cameras.

A four-point perpendicular datum plane is formed at each end of the course by (1) the center of the camera lens (2) the bench marks (3) an alignment cable, and (4) an alignment stake. The high-speed camera, which winds 16-mm film at the rate of 500

# f/1.9 SUPER-SNAPLITE

*Question Box*

No. 5



## ARE SNAPLITE LENSES SEALED?

All Snaplite Series II and Super-Snaplite lenses manufactured since January 1946 are of sealed construction to prevent entrance of moisture, dust or oil.

## HOW ARE THEY SEALED?

This is accomplished by using a one-piece lens barrel made from a solid bar with no threaded joints. The front and rear lens elements are sealed by means of synthetic rubber gaskets.

## SHOULD SEALED LENSES BE TAKEN APART?

No! Never disassemble a Snaplite Series II or Super-Snaplite lens. If any indication develops that the lens needs to be taken apart, it should be returned to the factory for complete examination.

## WHY IS ALUMINUM USED FOR SNAPLITE LENS MOUNTS?

Because of its light weight, high strength aluminum alloy is preferred to brass for lens mounts, especially if it is protected by anodizing. Gold anodized finish is used on Super-Snaplites, while black was selected for Series I and Series II Snaplites.



## ARE PLASTIC MOUNTS USED IN SNAPLITE LENSES?

Definitely not. The black anodized aluminum barrel has been mistaken for plastic, but we do not consider plastics as being suitable materials for mounting lenses of high precision.

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*Optical*



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pictures per second, records the flight of the plane some 800 feet out beyond the camera stations, parallel to a line joining the bench marks.

The optics of the camera are such that

the actual exposure per frame of motion pictures is 1/1500 second, corresponding to an airplane movement of 0.655 feet traveling at 670 miles per hour. By making certain corrections, it is said to be possible to determine the position in space of the aircraft at 700 miles per hour to an accuracy of  $\pm 0.25$  feet per pass. The electronic timing equipment is very complicated. The secondary timing clock is recorded on each exposed frame of the motion picture.



Improved 1949 model of DeVry in-car speaker

plug-in type which may be replaced as readily as a tube. All resistors, except those in the power stages, are of a precision type with a maximum tolerance of 1%.

M. W. PAARMAN has been appointed sales manager for the DeVry 35-mm Theatre Equipment Division. A veteran of more than 20 years with DeVry, PAARMAN recently headed up the 16-mm section for the company.

PAARMAN succeeds IRA L. FLEMING, who is now associated with the Midwest Theatre Supply Co., Chicago, handling DeVry theatre projection equipment in Illinois.

## IN THE SPOTLIGHT

(Continued from page 19)

Local to devote his entire time to the B Local. Ted Foley, recorder for Local 348, was elected to fill the post vacated by Foster, and Les Walker, former executive board member, was elected recorder.

About 18 months ago the IA granted a charter to T-B Local 72 and appointed Bob Foster to organize it. The Local now has a membership of 200, Foster having recently successfully concluded new contracts for the members calling for increased wages. Results are what count—and the records show that Bob certainly produced them.

- On behalf of the AK Club we extend a welcome hand to our old friend, Conrad Krieger, secretary of Local 586, Grand Island, Nebr., who recently joined the ever-growing ranks of grandfathers. It is an old story to yours truly—we made the grade three times to date.

- Several years ago Harry Barco, business manager for St. Louis Local 143, had the foresight to sign up Station KSD-TV and placed one of his members on the job. Evidently the top brass at KSD are pleased with the deal, for now that the station has expanded its activities, they recently signed up for a second Local 143 man. Each man on the job receives \$100 for a 40-hour week.

- Boston Local 182 has long been

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HIGH QUALITY  
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## DeVry 1949 In-Car Speaker

Many of the new weather-proofed 1949 model DeVry In-Car speakers are already installed in drive-in theatres throughout the country. Features include all the latest improvements in materials and finishes that have proved best after years of extensive tests in the laboratory and in the field. The speakers are streamlined for lightness in weight, yet are fabricated of materials that will stand up under constant use.

The speaker case is of anodized heavy gauge aluminum alloy. The aluminite finish is highly resistant to corrosion, chipping and peeling, as well as being easier to see in the dark by the drive-in patron.

G. E. speaker units featuring aluminum voice coil mountings are incorporated. These mountings will not alter their shape or be affected by heat and moisture. A heavy Alnico V permanent magnet speaker assures the highest efficiency. Drain holes empty rain water or condensation from inside of case. The transformer is likewise weather-proofed for continuous, trouble-free service.

## Westrex 100-Watt Amplifier

A new 100-watt Class A amplifier built as a single unit has been designed by Westrex Corp. It marks the first amplifier of its kind available for theatre use. The Class A push-pull power stage reduces harmonic distortion to less than 1½% at the full rated output. Microswitches automatically provide full protection against high-voltage hazards.

The voltage driver unit is identical to that used in all Westrex high-powered amplifiers and may be completely replaced, in the event of failure, simply by the use of a screwdriver. Only one electrolytic condenser is used in amplification, that being of the

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## TORONTO LOCAL 173 HONORS BILL COVERT



William P. Covert (left), business manager of Toronto Local 173 and 2nd IA vice-president, was presented with a traveling bag by the members of the Local prior to his departure for Geneva, Switzerland, where he will act as advisor to the Canadian delegation to the International Labor Conference. James Sturgess president of 173, made the presentation.

plagued by the existence of a dual organization known as the Knights of Labor, which operated under a State charter for more than 30 years. A series of conferences extending over a three-year period between the officers of the IA and K. of L. locals led to the dissolution recently of the latter organization and, at a special meeting held on May 16 last, Local 182 granted full membership to the K. of L. members working in its jurisdiction.

Representing Local 182 at the negotiations were Joseph Nuzzolo, Sr., and Walter F. Diehl, president and business manager, respectively, and the Local executive board. William C. Scanlan, IA trustee, obligated the former K. of L. members.

### 25 Years Ago—June 1924

• William F. Canavan re-elected president at the 27th IA Convention held in Cincinnati, Ohio. . . . Fred Dempsey,

## BOSTON LOCAL ELIMINATES RUMP UNION



Officers of Boston Local 182 and of the Knights of Labor in a final get-together after the latter outfit surrendered its charter to the IA Local. Shown above, left to right, are Joseph Nuzzolo, Sr., president of Local 182; Harry Martin, business agent, and Samuel Garfinkle, president of the now defunct K. of L., and Walter F. Diehl, business manager of Local 182.

Bill Covert, Bill Elliott, H. Guy Culver and Cleve Beck, re-elected IA vice-presidents. Two new vice-presidents, George E. Browne and Thomas Flahive, were elected. Flahive resigned shortly after the election returns came in and the General Executive Board unanimously elected John P. Nick to fill the vacancy. . . . Charles H. Bonn, IA president in 1901, obligated all the elected officers. . . . Injunctions against labor an important factor in labor controversies. Kansas State Federation of Labor assisted Wichita Locals 190 and 414 in appealing injunctions obtained by theatre managers. . . . Charters were granted to motion picture studio workers in Los Angeles and Greater New York. . . . The per diem for convention delegates boosted from \$8 to \$10 per day.

## IA ELECTION

### LOCAL NO. 4, BROOKLYN, N. Y.

Richard F. Walsh, *pres.*; John Hinchie, *vice-pres.*; Linford Risley, *sec.*; Theodore Samuelson, *treas.*; Thomas Murtha, *bus. mgr.* Harry Bennett, Parker Mann, Fred Marshall, Thomas Murphy, Jack Patten, Walter Will, *exec. board*; Fred Kraus, Albert Linde, Fred Schonberg, *trustees*; Charles Cohen, *sgt.-at-arms*.



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FOR EVERY THEATRE NEED**

**NATIONAL**  
**THEATRE SUPPLY**  
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# CARBON COOLING OF HIGH-CURRENT ARCS

(Continued from page 17)

cooling. By water-cooling, however, its consumption is reduced by as much as 35%. In order to demonstrate the scattering of the measurements, some consumption-brightness measurements for the uncooled arc are plotted in Fig. 10.

## Influence on Crater Depth

There is also a marked influence of water-cooling on the crater depth which, referred to arc wattage (Fig. 11), or

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HOWARD R. JOHNSON—Manager, Strand Theatre, Hamden, Conn.—says:

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brightness (Fig. 12), becomes shallower by cooling the positive carbon. This effect, although in Fig. 12 amounting to only approximately 14% at higher brightness, is of technical importance, because too deep a crater is not well suited for illuminating lenses or mirrors of large apertures.

Measurements carried out with the air-cooled head (Fig. 3) gave results similar to those just described; however, the differences in the properties between the air-cooled and the uncooled arc are not quite so large as those between the water-cooled and the uncooled arc.

All described results, attained with the carbon No. 070 were checked with two further experimental carbons, Nos. 081 and 088, and with regular 12-mm searchlight carbons. While the absolute values of all arc properties varied because of different values of core and

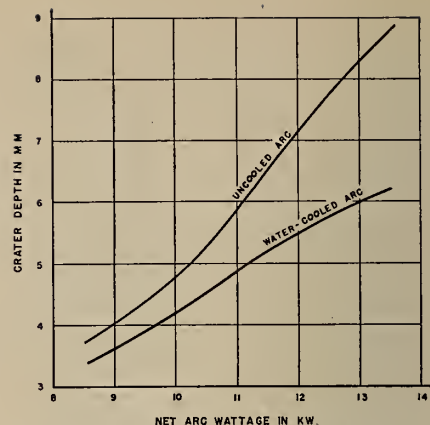


FIG. 11—Comparison of crater depth of cooled and uncooled arcs for equal net arc wattages.

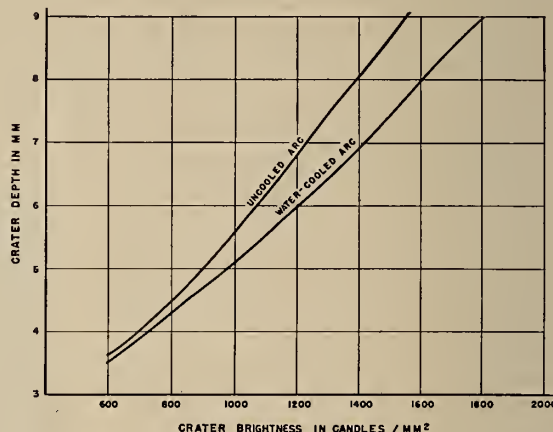
though more pronounced with carbons specially designed for this purpose.

## Results, Theoretical Conclusions

From the technical point of view, water-cooling of both carbons has the advantage of making possible the application of considerably higher brightness

FIGURE 12

Comparison of crater depth of cooled and uncooled arcs for equal crater brightness.



shell diameters, the change of the arc properties as a consequence of cooling the positive carbon was similar to that for the carbon No. 070. The effect of carbon cooling on the high-current carbon arc thus seems to be a general one,

than was hitherto possible with good steadiness of the arc, with a shallower crater depth, and with greatly reduced carbon consumption. The only disadvantage is that the required current is considerably higher than without cooling, while the decreased arc voltage does not form a compensating technical advantage.

From the physical point of view we have three important results:

1. The reduced net arc voltage indicates a decrease of the anode drop as a result of cooling the positive carbon.
2. No arc property was found which was not changed by cooling the positive carbon, leading to the conclusion that a cooled and an uncooled carbon behave like carbons of different composition or structure, these internal changes being caused by the different temperatures immediately behind their burning ends.
3. These internal changes in the car-

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bons have been confirmed by X-ray diffraction studies, the results of which will be described in detail in a future publication.

### Mechanism of Cooling Influence

The mechanism of the cooling influence follows from these results in connection with earlier investigations of the arc mechanism by the author, and can be indicated here only briefly.

The electrons, accelerated by the anode-drop potential, transfer an energy of 6 to 7 kilowatts to each sq. centimeter of the crater surface which serves to vaporize anode material and heat it to a temperature of about 6000 to 7000 degrees Kelvin.

The illuminant vapor is heated furthermore by collisions with electrons in and immediately in front of the positive crater, the electrons dissipating there an additional amount of 2 to 3 kilowatts. The resulting vapor temperature of 7000 to 8000 degrees Kelvin is responsible for the high brightness of the crater vapors.

The limit of load which a positive carbon can stand, and which determines the maximum brightness, is given by the transition to an unsteady, explosive vaporization instead of the desirable smooth and steady evaporation. This limit depends on the chemical and physical structure of the carbon.

The possibility of using higher current density and thus attaining higher brightness by cooling the positive carbon seems to be caused by two effects: First, we have a reduction of the anode drop which means a reduction of the energy spent for vaporization at a given current. Second, the carbon, being kept cool up to a point quite near to the crater, keeps its original structure unchanged (compared with the highly heated uncooled carbon) and therefore is able to stand a higher load before beginning to evaporate unsteadily.

**Editor's Note**—Another article on the water-cooling of carbon arcs, by National Carbon technicians, will appear in an early issue, probably the next.

### 'MATCHED' PROJECTOR OPTICS

(Continued from page 12)

rors), a spurious and misleading system that I have attacked time and again.

I pointed out<sup>1</sup> why *F*-numbers should be used for rating projection lenses, and should not be used for rating condensing elements.

<sup>1</sup> "This 'Matching' of Projection Optics," by Robert A. Mitchell; IP for March, 1949, p. 7.

**Your Best Buy . . .**

**U. S. SAVINGS BONDS**

The measurement of working distance from the periphery of the mirror to the film plane instead of from the center of the mirror to the film plane is an interesting point brought out by Mr. Cricks, and one which I had carelessly overlooked. I believe that both measurements of distance are useful, but they should be given distinguishing names upon which all workers in the art agree.

For the present I shall use the mirror-center to film-plane "working distance" for the calculation of mirror focal characteristics, and the mirror-periphery to film-plane "working distance" for matched optics computations.

### Definition of Terms

The "experiment" mentioned by Mr. Cricks to reveal the direction of the rays which illuminate different portions of the projector aperture are entirely in line with my exposition of the subject in the article referred to.<sup>1</sup>

I attributed part of this effect to spherical aberration of the mirror. I neglected to mention that the remainder—the greatest part—of the effect is due to the fact that the rear element of the projection lens lies considerably beyond the focal image plane of the mirror (the image of the arc) which, it may be assumed, coincides with the film plane at the aperture.

It is impossible, therefore, for the projection lens to "look" through the aperture and "see" a uniformly illuminated mirror. Hence different areas of the lens "see" different areas of the film picture in the aperture under varying degrees of illumination. All this is in complete agreement with Mr. Cricks's discussion.

The reference by Mr. Cricks's to "or-

thodox" optical formulas of recent appearance in the American trade press naturally turns my thoughts to the "general formula" for matched optics which



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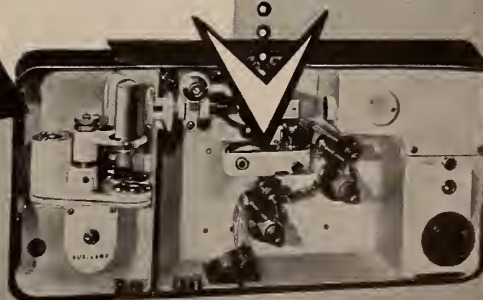
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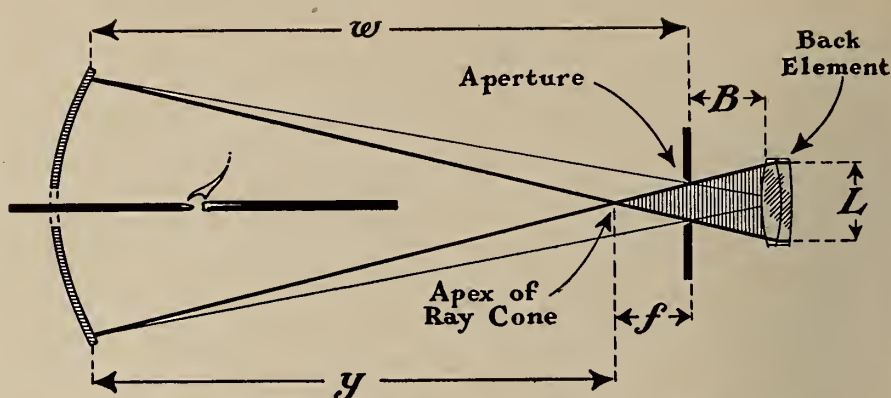
I developed for the convenience of readers of IP (it appeared in two forms on page 9 of IP for March, 1949).

True it is that this formula does not take account of "eclipsing" in the projection lens—indeed, that would require a separate formula for each type of lens! However, eclipsing is negligible in present-day lenses. There are no stops in any modern American projection lens that I know of; and, furthermore, when an American manufacturer rates a lens at a given speed, he means that the complete, assembled lens has that speed—not just the back element alone.

### The Vignetting Effect

The vignetting effect arising in the projection lens is therefore ordinarily due to the fact that the lens in question simply is not large enough to match the lamp condensing element. My general formula enables calculation of the  $F$ -number of any lens matching a given lamp. If it were possible to use a lens having the exact speed given by the general formula, there would be absolutely no vignetting caused by the lens—any vignetting present would be due to a poorly designed lamp.

In many cases it is quite possible to use lenses sufficiently large to reduce lens vignetting to a negligible quantity, but in most cases perfect matching cannot be attained because lenses large enough are not available. Of course, I regret exceedingly that "the results obtained from these formulae indicate the entire impossibility of meeting the requirements" (of perfect optical match-



Illustrating the points made in accompanying article by R. A. Mitchell.

ing), but things are as they are, no more and no less, and the general formula conforms to unalterable facts.

### Conception of $F$ -Numbers

It interests me greatly to see that Mr. Cricks attempts to traverse the ground which already bears my footprints; viz., the preliminary determination of the dimensions of the cone of light which emerges from the aperture. But his analysis of the situation is erroneous because of his refusal to reject the false and worthless  $F$ -number ratings of mirror speeds. Although his formula

$$L = \frac{B + f}{f}$$

(in which  $L$  is back-element diameter,  $B$  the distance from back element to aperture, and  $f$  is the distance from "crossover point" to aperture) is correct as it

stands, his definition of  $F$  is incorrect.

The distance of the crossover point of the marginal rays behind an aperture of 1 inch diagonal is not given by the  $F$ -number of the mirror. His error approaches 0 as the spurious mirror  $F$ -number approaches 0, and his error approaches an infinitely great number when the mirror speed approaches infinity. For the average projection set-up the error is in the neighborhood of 10%.

The true value of  $F$  is derived as follows. (Refer to the accompanying diagram for the meaning of  $w$  and  $y$ .) Because  $w = f + y$ , the value of  $w$  in terms of  $f$  is given by  $w = f + fr$ , in which  $r$  is the ratio of  $y$  to  $f$ . Solving for  $f$  we obtain:

$$f = \frac{w}{1 + r}$$

which is the desired correct solution of the distance of the cross-over point from the aperture.

The dispersion of light by silver grains in the film emulsion and the suspected reduction of image contrast values from this cause when extremely "fast" lenses are employed is an interesting topic. Such an effect cannot possibly result when Technicolor film is projected, however, for there are no silver grains in the dye image.

While admitting the existence of dispersion in black-and-white films, the writer is not convinced that the effect would ever be sufficiently pronounced to show up on the screen. More contrast is lost through soiled and scratched lenses and port glasses and by stray light in the auditorium than by any other assignable causes. We must remember, of course, that the processors of film can adjust the contrast characteristics of prints over a wide range. In fact, prints are deliberately made more "contrasty" than the actual scenes photographed.

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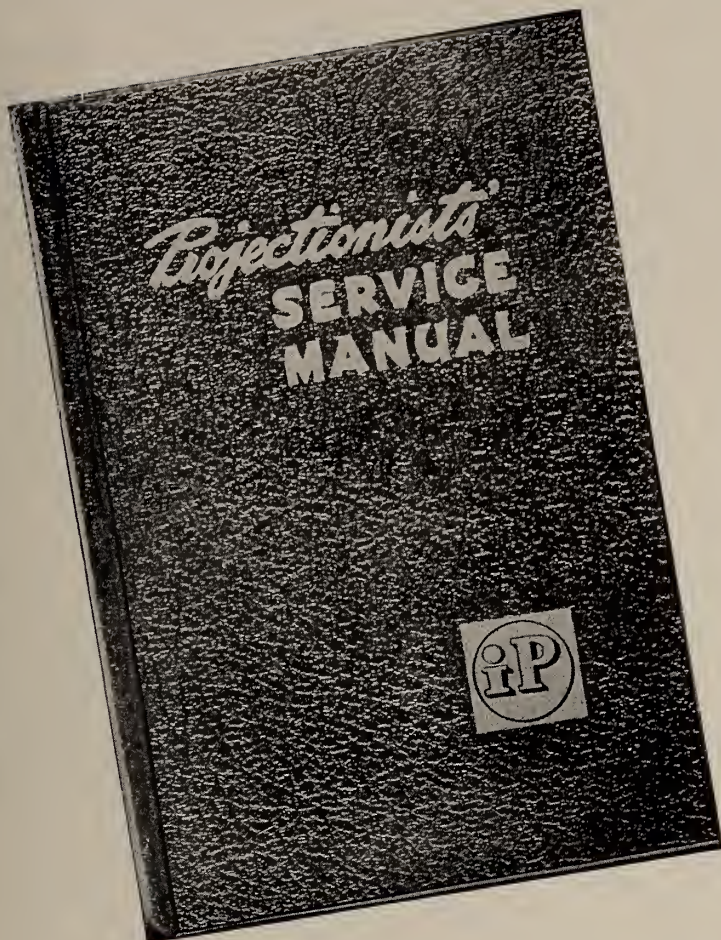
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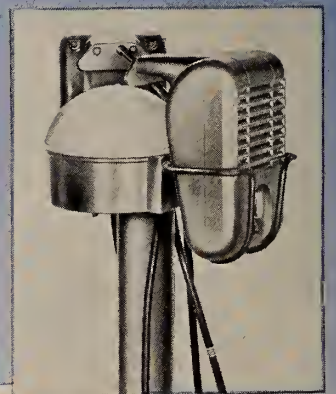
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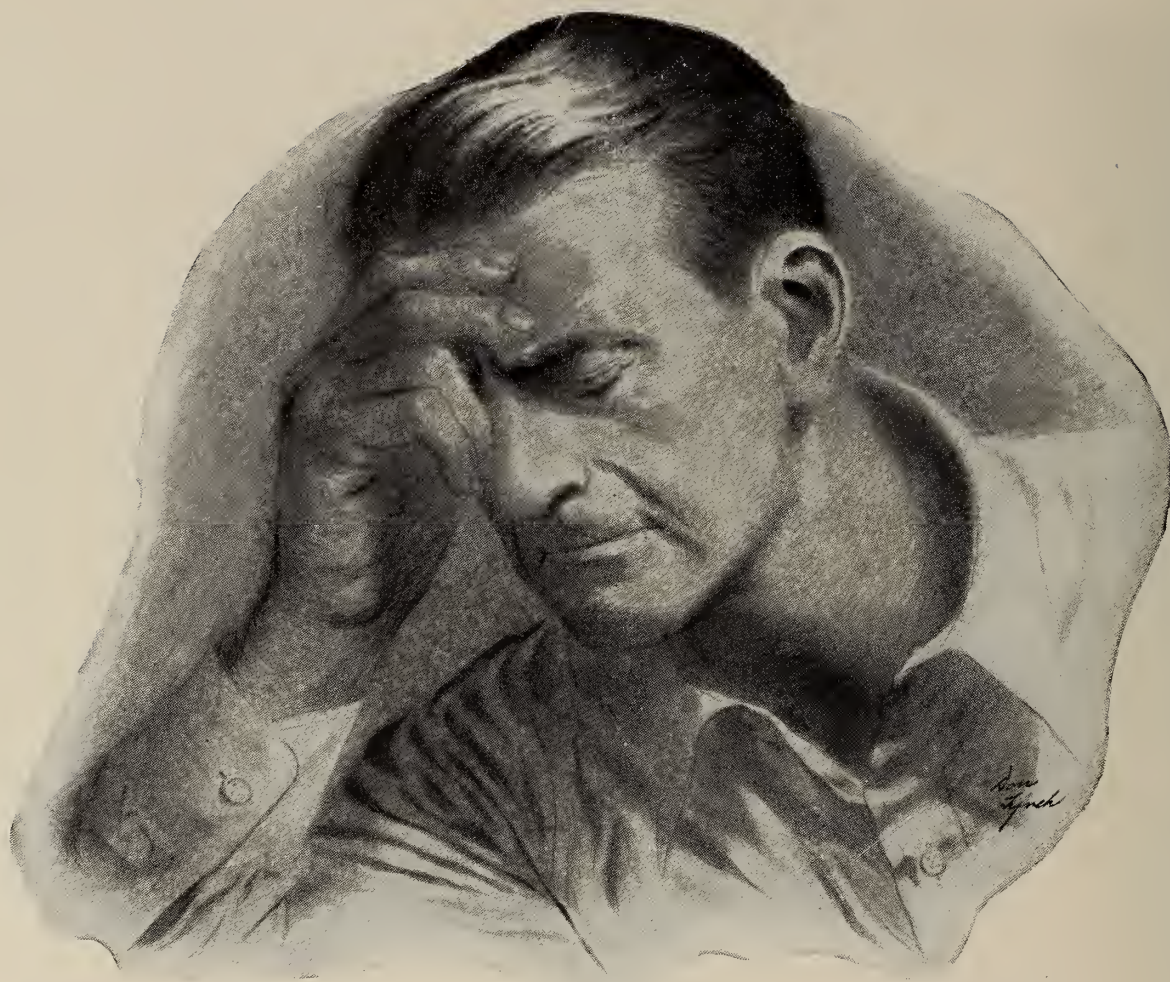


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# INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING



HENRY B. SELLWOOD, *Editor*

Volume 24

JULY 1949

Number 7

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## MONTHLY CHAT

IT'S time, we think, that an inclusive look-see be had at the various devices now being employed as "effective" cooling agents for motion picture equipment. The problem posed by the ever-increasing amperages utilized for projector arcs in all categories is a two-sided one involving the arc lamp and the film. Obviously, no single cooling unit can solve this duplex problem, notwithstanding the preposterous assertions anent effectiveness that are being bandied about by the sponsors of such devices.

The word "cooling," as used here to denote the specific function of a unit, is subject to considerable elasticity of interpretation, depending in this instance upon which horse is being backed by whom. We think it imperative that the true functions of these various devices be assayed in terms of actual accomplishment in the projection room. Methods of cooling now being advocated are:

1. Glass filters positioned between the arc and the film.
2. Carbon cooling by means of a continuous flow of water around the jaw.
3. Blowers which direct a continuous blast of air upon the aperture.
4. Water-cooling of the aperture plate.

Certain installations, particularly those de luxe theatres and drive-ins which utilize arc amperages ranging up to 190, employ a combination of the aforementioned cooling aids; and not a few situations use a three-unit combination—glass filter, carbon jaw water-cooling, and a blower unit.

GLASS FILTERS. These filters are represented by their sponsors as being capable of passing all the "useful" light the while they filter out the heat-producing rays which tend to buckle and otherwise affect adversely the film. IP is advised by a well-known research laboratory, which has had extensive experience with lighting problems, that glass filters in a typical motion picture projection set-up do effect a reduction of about 50% in the heat transmitted to the film—but at a cost of about a 20% reduction in effective light!

"On the whole," states the laboratory report, "our tests indicate that glass filters are quite unsatisfactory for this specific application." Contrast this report with the statements of not a few projectionists who, although admitting that they have never taken readings on the filter-equipped set-up, insist that they can detect with the naked eye a "great improvement" in the screen image.

IP has never approved the use of glass filters for projection, despite the off-the-cuff reports from projectionists with assertedly keen vision. Common sense would seem to dictate the answer to this one.

CARBON JAW WATER-COOLING. Let it be said at the outset that this method is strictly a protective measure for lamp-

(Continued on page 24)

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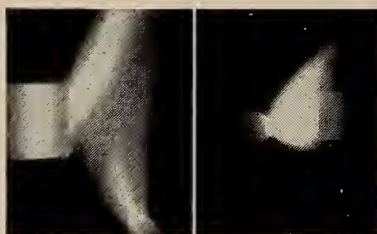


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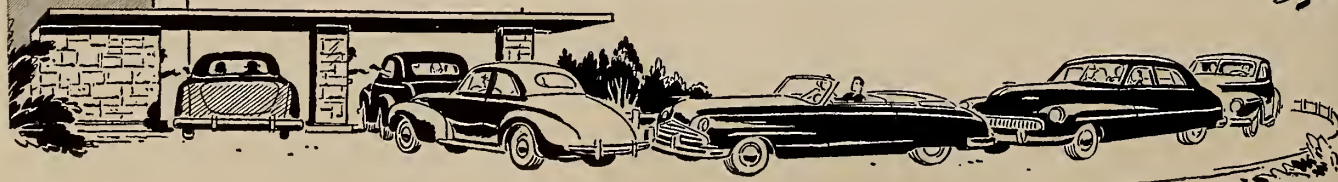
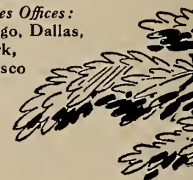
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# Distortion Factors in Sound Reproduction

**S**OUND distortion sometimes occurs in the recording process. This is especially true of commercial gramophone records. (Standard disc records manufactured in the U.S.A. during the period 1940 to 1946 are probably the world's worst.) Nevertheless, we are cautioned to distinguish between "natural distortion"—the alteration of sound *en route* from the source to the recordist's microphone—and the unwanted distortion produced by the recording apparatus, by the recording medium and its processing, and by wear or mishandling on the recording medium (film or disc).

In other words, the sound imprisoned in the soundtrack of a motion picture film is not necessarily the same as the sound which issued from the original source, *but it must be the same as the sound which the microphone "heard."* If it is not, the sound is distorted in the record, and there is little or nothing that the projectionist can do about it. (Of course, sounds are sometimes deliberately distorted in order to create special and unusual effects.)

## Typical Distortion Process

How does sound "distort" as it passes from its source to the microphone? Imagine that an actor is speaking in a large room or similar "set." Two cameras at some distance away are focused upon him—one camera having a short-focus lens to photograph a "long shot," the other with a long-focus lens to give a closeup view of the actor's face. (The film editor will cut back and forth

By ROBERT A. MITCHELL

## II

between these two shots when making up the final negative for the release prints.)

Now suppose that the microphone is near the cameras—a considerable distance from the actor. The actor speaks his "lines," both cameras shoot the scene simultaneously, and the sound recorder "in sync" with the cameras photographs the single sound negative for both cameras.

When the "rushes" are shown a glaring error appears. The long shot is run first, let us say, the sound being furnished by a separate soundtrack positive run in a dummy soundhead synchronized with the picture projector. The results are satisfactory. The vast room appears on the screen, and when the actor in the background speaks, his distant voice echoes through the room in an entirely natural way.

Then the sound positive is rewound and run with the closeup shot. The actor's lips move, but the voice is thin and distant, as though someone were speaking from another room. Obviously, the closeup must be retaken with the microphone *close* to the actor.

The same mistake can be made on outdoor locations. We can tell by listening whether the microphone was close to the sound source, or far away. Sound really does change in quality as the distance between source and listener is altered.

Aural nearness is suggested by a heavy bass response, and indoors by a lack of echo. Aural distance is characterized by an attenuation of bass to result in a "thin" response, and indoors by echo and reverberation.

## Recording, Printing Defects

It is interesting to note that trick electrical circuits and rerecording processes can fake these effects. The poor carrying power of the bass is overcome in outdoor concerts by having the orchestra perform before a large concave sound reflector. The acoustic engineer is able to alter the "brilliance" of interior recordings at will by changing the "deadness" of the set.

Distortion is sometimes introduced into the soundtrack record by defects in the recording apparatus and by errors of operation. This type of fault, together with distortion introduced by the film-processing laboratory, is not so common as it used to be, but we do meet it once in a while, especially in reissued productions printed from duplicate negatives made from positives.

About 15% of the sound and picture quality is lost through each printing; hence a positive made from a duplicate negative has only about 71% the quality of a positive made from the original negative. (When the "dupe" is made from a "lavender protection print" the percentage of quality may be somewhat higher; and when the dupe is made from an old, projection-worn positive, the percentage of quality is shockingly lower.)

Sound distortion arising through de-

veloping, printing, and poor emulsion characteristics is always of the non-linear type. Overexposure or overdeveloping of the films may "fuzz" the records so that the finer striations are lost and the wider ones broadened, and place variable-density recording in the region of chemical fog and non-linear exposure. Underexposure of variable-density tracks may also cause a loss of the higher frequencies and more or less non-linear distortion. The photographic work entailed by sound-on-film recording is delicate and highly specialized.

### Soundtrack Modulation

Overmodulation of both types of soundtracks introduces serious non-linear distortion. Fig. 4 shows what is meant by this technical term. Three sample variable-area tracks are shown in the drawing, each track being a record of a pure (sine-wave) 144-d.v. tone—the D an octave below "middle D" on the organ or piano.

The topmost track is *completely modulated*. The variations are of such amplitude that they completely fill the length of the projector soundhead scanning beam (0.084 inch). It is impossible to record without distortion a 144-d.v. tone of greater volume than the one shown in this track.

Now, the next track shown has variations of greater amplitude than this. It is easy to see that the scanning slit cannot accommodate waves of this modulation. The result (shown in the part labelled "scanned area") is a distortion in the reproduced wave—non-linear distortion. It can be mathematically demonstrated that overmodulation introduces strong second, fourth, eighth, and other spurious harmonics into the sound.

A slight degree of overmodulation is sometimes permissible in recordings of thunder, explosions, and other excessively loud sound, which are noises rather than tones. Distortion is present, of course, but it is not nearly so objectionable as it would be in speech and music.

The bottom track in Fig. 4 is somewhat undermodulated. It is, in fact, a high-fidelity "low-level" soundtrack. If the tone so recorded is reproduced at an optimum average level, there will be plenty of leeway for louder, as well as softer, sounds. Most feature films have low-level tracks.

### 'Noisy' Tracks on Decline

Overmodulation in variable-density tracks is not readily detected by visual inspection, but the effects are approximately the same as with overmodulated variable-area tracks. Overmodulation may also arise from electrical causes in the recording amplifiers, and this is invisible to the eye (except by comparison).

"Noisy" sound-on-film recording is for-

tunately not as common as it used to be, hence silver-grain noise, photocell hiss, and the noises caused by slight surface scratches on the celluloid side of the film are not quite so troublesome as they were in the days before "noiseless" biased recording. Deep scratches, "sprocketing" marks, etc., in the film emulsion still are troublesome, but there is little that the projectionist can do about them except complain sharply to the distributors. (A word to the film salesman is sometimes most effective.)

Images of the sprocket holes of the negative or of frame lines in the soundtrack area produce the same hums and "motor-boating" noises which appear when the soundhead lateral film guides are out of adjustment. A visual examination of the print with the aid of a magnifying glass will reveal this type of trouble.

We have spoken at length of the various types of sound distortion which may creep into the film; but it cannot be gainsaid that most cases of bad sound originate right in the theatre. This is nearly always due to the use of antiquated and defective sound equipment which the shortsighted exhibitors cling to tenaciously.

### Trouble-Shooting Guide

Enough has been said to aid the detection of distortion at once and to make a reasonably good guess as to its nature—frequency, non-linear, travel, or extraneous—so we shall do no more than outline a trouble-shooting guide which may further the friendly cooperation between projectionist and sound service engineer.

1. FREQUENCY DISTORTION. *Symptoms:* Sound which is tubby, wooden,

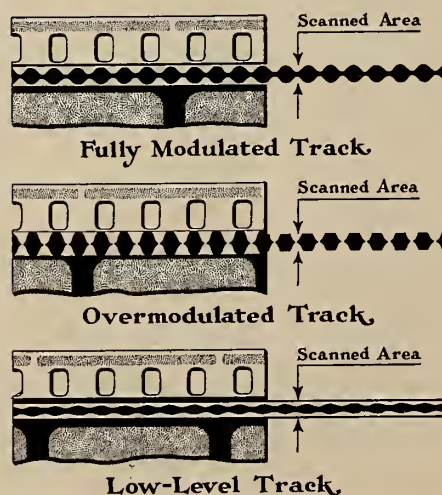


FIG. 4. Variable-area soundtracks of a pure 144 d.v. tone. The extensions labelled "scanned area" show how much of each track the photocell "sees".

Notice that the overmodulated track produces a distorted response because the recorded variations have an amplitude too great for the dimensions of the scanning beam.

metallic, hollow, or in which excessively sharp or boomy tones appear from time to time.

*Causes:* If sharp "peaks" are detected at one or more frequencies, the speaker units or amplifier transformers (coupling and/or output transformers) may be at fault. Other causes are faulty acoustics of the auditorium and backstage region, and also (very rarely) resonance in amplifier tubes which have loose elements. Ordinary frequency distortion seldom, if ever, originates in the soundhead.

*REMARKS:* The use of pure-tone (sine-wave) frequency test films or disc records<sup>1</sup> and an output meter are necessary for an intelligent appraisal of the defect.

The frequency-distortion factor of the amplifier at different volume levels is measured by connecting the meter to the amplifier output; but whereas the speakers are very likely to be the chief cause of frequency distortion, it is imperative to take readings from the meter when connected to a small independent amplifier of uniform response characteristics and a microphone. (An acoustic engineer's decibel meter is ideal.)

The microphone is placed in the auditorium to "listen" to the test tones issuing from the stage speakers. Variations of 10 db over the main frequency range of 100 to 4,000 d.v. may be expected of the average sound system, but the existence of sharp resonance peaks greater than 5 db is cause for drastic changes.

A difference in response curves obtained by placing the microphone in different parts of the auditorium indicates a directional characteristic in the speakers—possibly combined with unsatisfactory auditorium acoustics. In theatres having but one stage speaker, and where there is a balcony, aim the speaker at the middle of the front of the balcony; otherwise there will be too great a difference in sound volume between orchestra and balcony. If the speaker is aimed at the audience downstairs, it is entirely possible that orchestra patrons will complain of too much volume, while gallery patrons complain of too little volume. A happy medium must be found in order that everyone be satisfied.

### Loss of 'Highs' and 'Lows'

2. LOSS OF HIGHS. (This is technically a special case of frequency distortion.) *SYMPTOMS:* Music muffled, as though coming through a curtain; voices boomy and articulation indistinct.

*Causes:* Soundhead optics out of focus or azimuth (also causing non-linear distortion); dirt in the gates of old-style  
(Continued on page 29)

<sup>1</sup> The following multifrequency film and disc test recordings are recommended: "SMPE-Academy" 35-mm. Multifrequency Test Film Type B, No. ASFA-1. "Columbia" 78-R.P.M. Frequency Response Test Record, No. 10003-M.

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**D**URING the past few months IP has received an ever-increasing number of inquiries relative to the present status of the cadmium-mercury vapor lamp. Not a few technicians apparently believe that this "new" light source has reached the stage of development where it poses a serious challenge to the long-established supremacy of the carbon arc in the motion picture field, for both studio lighting and theatre projection.

The spark that ignited a smoldering

from projects sponsored by the British Admiralty. In fact, the Carlson paper previously mentioned<sup>1</sup> was based largely on data supplied by the Messrs. Bourne and Beeson, of British-Thomson-Houston Co., Ltd.<sup>2</sup>

So much for background, except for the notation that the M. V. lamp, even in its application to the motion picture field, is definitely not "new." N. V. Philips Co., of Eindhoven, Holland, generally regarded as one of the outstanding

arcs. However, the highest brightness portion of the source ( $\frac{3}{8}$ -inch arc—9.5 mm) extends over only a very small area, while the region of intermediate brightness extends over a large volume. There exists considerable uncertainty as to just how well typical projection optical systems, or even those especially developed for the M. V. lamps, will be able to focus a light source extended over such a large volume.

The M. V. lamp is credited with the

# Cadmium-Mercury Vapor

interest in the M. V. lamp on the part of these technicians was supplied by a paper presented by F. E. Carlson, of General Electric Co., before the SMPE in the Fall of 1947<sup>3</sup>; and this interest was fanned into flame by the appearance subsequently of numerous stories in the technical, trade and lay press which conveyed the idea that as a result of certain improvements effected the M. V. lamp had "arrived."

## Concerted Promotion Campaign

Joining G. E. in energetic promotion of the M. V. lamp was Westinghouse Electric Corp., from whence emanated several laudatory press releases, the while its representatives made a concerted frontal attack upon the ranks of "hard" lighting (carbon arc) advocates in the West Coast studios.

Nor was the campaign in behalf of the M. V. lamp confined to America: marked advances in M. V. lamp design and operation were scored by British manufacturers who benefited greatly from the accelerated developmental pace resulting

technical research laboratories in the world, pioneered in the development of the M. V. lamp; in fact, practically all the development work done in America on this unit was based on licenses granted by Philips.

As long ago as 1939 there appeared in these columns a comprehensive exposition<sup>3</sup> anent the applicability of the M. V. lamp to motion picture work—both studio lighting and theatre projection—and the intervening years have seen no marked diminution of certain major shortcomings of this unit. Among the problems which still plague the M. V. researchers are:

1. Shape and dimensions of the light source.
2. Requisite warmup time, ranging from 5 to 10 minutes before full brightness is attained.
3. Spectral deficiencies.
4. Interruptions due to lamp failure, whether at the expiration of useful life or through sudden breakage.

None of the aforementioned deficiencies has been overcome, at least not in terms of motion picture applications.

## M. V. Brightness Values

(1) Published curves do show brightness values in the range or near to the values obtained by conventional carbon

ability to produce a light intensity of the order of 800 candles per sq. mm. This figure, apparently predicated on operation of the lamp at its full rating of 10,000 watts, approximates the brightness of a 13.6 regular high-intensity carbon arc pulling 125-130 amperes.

In a demonstration of a M. V. lamp witnessed by the writer, however, the demonstrators displayed obvious reluctance to "push" the lamp to its full rated capacity (for reasons best known to themselves) and the writer estimated that the peak wattage used was of the order of 5-6000.

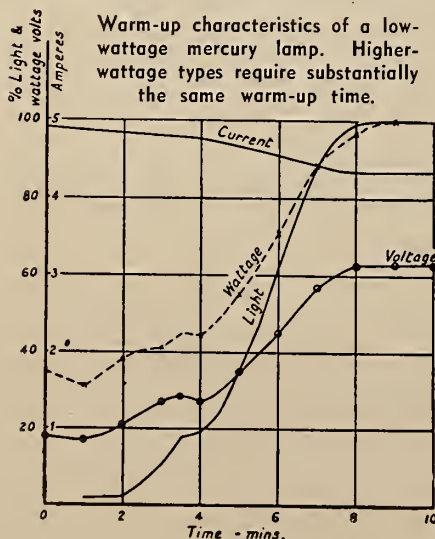
It follows, naturally, that peak rated wattage must be utilized to attain full brightness output, the ratio of diminishing brightness being disproportionately greater than the percentage of reduced wattage.

## Warmup and Starting Requisites

(2) The M. V. Lamp requires a warmup time to reach full brightness, variously reported as from 5 to 10 minutes. Also, the lamps are more difficult to strike when hot than when cold. In order to provide quick availability of full light output, it is apparently necessary to provide ovens, standby power, or some other means for accomplishing the same result.

When final operating temperature is attained, the M. V. lamp develops a high pressure which is in the neighborhood of from 10 to 40 atmospheres. Due to the large volume of these lamps and the high pressure, there is a hazard stem-

<sup>1</sup> "New Developments in Mercury Lamps for Studio Lighting," by F. E. Carlson; J. Soc. Mot. Pict. Eng., Feb. 1948, p. 122.



<sup>2</sup> "Color Modified Compact Source Lamp for Film and Television," by H. K. Bourne and E. J. G. Beeson; British Kinematography, Vol. 11, No. 4, Oct. 1947, p. 107.

<sup>3</sup> "Film Projection by Discharge Lamps," by G. Heller, Philips Technical Laboratories; IP for Aug. 1939, p. 7.



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ming from possible breakage. Provision must be made to protect equipment and personnel from the flying fragments of an exploding lamp.

These hazards, of course, are present only when the lamp is hot and not at all when it is completely cold.

Several years ago Philips exhibited a motion picture projector utilizing the M. V. lamp as a light source in which two lamps were mounted on a turret which, if one lamp failed, would enable immediate substitution of the second lamp. Of course, this procedure requires that the replacement lamp be already warmed up, at reduced wattage by means of a resistor, so as to be ready for instant operation.

Even this arrangement leaves much to be desired in terms of operating efficiency, because the inoperative lamp could not be replaced until it had completely cooled to room temperature. Carlson mentions<sup>1</sup> a method whereby a standby lamp may be first warmed up and then, by reducing the current to 10 to 15% of its full load value, is left to "simmer" until needed.

### **Spectral Characteristics Data**

(3) The most important recent improvement in the spectral characteristics of the M. V. lamp was the introduction in types of 1000 watts or more of cadmium and/or zinc which produce not only a generous amount of red radiation but also radiation in the blue-green region.

Westinghouse attempted to overcome the characteristic spectral deficiency of the cadmium-M. V. lamp by coating the surface of the bulb with phosphorus and thus convert some of the ultraviolet of the mercury-cadmium into visible light in the red region. This move would seem to indicate less than complete confidence in the spectral characteristics of the M. V. lamp even with the addition of cadmium.

There exists an element of doubt among technicians as to the permanence and continuing efficiency of phosphorus when used as a fluorescent material for such a purpose. In any event, and with the best will in the world toward the M. V. lamp, it would seem that this does not have the essentially *continuous* spectrum obtainable with the carbon arc.

(4) Interruption of operation due to the failure of a M. V. lamp, due to either the expiration of its useful life or through breakage, would be economically unsound in studio work and utterly intolerable in projection work. The mounting of several lamps on a turret and the adoption of the "simmering" technique would seem to be wholly inadequate for production work and impossible for projection.

The light output of a M. V. lamp falls

# British vs. American Projectors

*In which the Technical Editor of "Ideal Kinema" (London) and the Editor of IP exchange views on the relative merits of British and American soundfilm projection equipment.*

By R. H. CRICKS

WARFARE is imminent between the United States and Great Britain—or is it? I referred previously to descriptions in *International Projectionist* of recent British projectors, and expressed the opinion that this equipment was years ahead of American design. One could hardly expect IP, as a patriotic American publication, to subscribe to these views. In the March issue (p. 5) the statement is made that at least four American machines—Brenkert, Century, Motiograph and Simplex—"accomplished precisely the same thing, not only in America, but in far-flung corners of the earth which never see a serviceman."

We have not, of course, seen any of these machines in its complete form in this country: the Brenkert and Motiograph we do not know at all; the Simplex we see only fitted with other makes of sound; while the Century is, of course, the Westar machine fitted with Westrex sound. I am, therefore, at rather a disadvantage in expressing opinions on the subject.

### **Fifth Column Activities?**

But I must confess to some surprise at reading comments by "a British technician of vast experience" who apparently has no use for British equipment and who has acquired the American idiom.

off gradually to about 75% of its initial value at the end of its life, owing to blackening of the bulb. Gradual blackening of the bulb, however, falls far short of a satisfactory warning signal to any technician in the graphic arts field.

One other point bearing on the safety factor seems worthy of mention in passing. To quote Carlson<sup>1</sup>:

### **Movie Application Still Distant**

"Mercury lamps emit radiations in that portion of the ultraviolet spectrum which cause sunburn or conjunctivitis. These rays are absorbed and rendered harmless by the outer bulb which is used with most such sources. Since such an outer envelope is not used with the mercury vapor lamps described here (i.e., for motion picture use—Ed.) it follows that they must be enclosed in housing providing the same degree of protection that prevails for carbon arcs."

There is no intent here to minimize the importance of the M. V. lamp as a

His remarks are worth quoting in full:

"I fully agree with remarks in IP for December 1948 last (Monthly Chat, p. 3). I should dearly like to write an article debunking these British projectors of recent design, but, obviously, I cannot. I'm all for standardization of equipment, thus I think that stuff like the SUPA is completely retrograde.

"Any exhibitor who is kidded into buying one of these outfits is completely tied to one firm for many years to come. From the projectionist's viewpoint, such apparatuses mean that he has either got to be a superserviceman to maintain it or he must be a brainless coot.

"The Kalee isn't quite so unorthodox a design, but here again the buyer is tied down to one supplier for any future development. I can understand and appreciate the utility of a streamlined aircraft, automobile or railroad locomotive, but I'm darned if I can see the sense of a streamlined projector. And streamlining is about the only 'modern' aspect of these mechanisms."

### **The SUPA Projector Achievements**

Now, the SUPA has had its teething troubles. But, despite the views expressed by this British technician, I still consider it the most outstanding development in projection equipment for half  
(Continued on page 27)

most worthy entry into the list of efficient light sources. On the contrary, there are innumerable applications wherein the M. V. lamp might well prove itself at least the equal if not actually superior to any other known artificial light source.

It seems obvious, however, that in terms of *specific application* to the motion picture field, whether in the studio or the theatre, the M. V. lamp still falls short of meeting essential requirements. Perhaps the best summation of the present status of the M. V. lamp was given by A. G. Penny in a recent lecture before the British Kinematograph Society<sup>2</sup>:

"The carbon arc still remains the best all-around light source for kinema projection. It is my belief that this situation will change, but I feel that some new discovery in the world of pure science is necessary before the arc relinquishes the supremacy it has held for the last 50 years."

<sup>1</sup> "Can the Discharge Lamp Oust the Arc?"; *The Ideal Kinema*. (London), May 5, 1949.

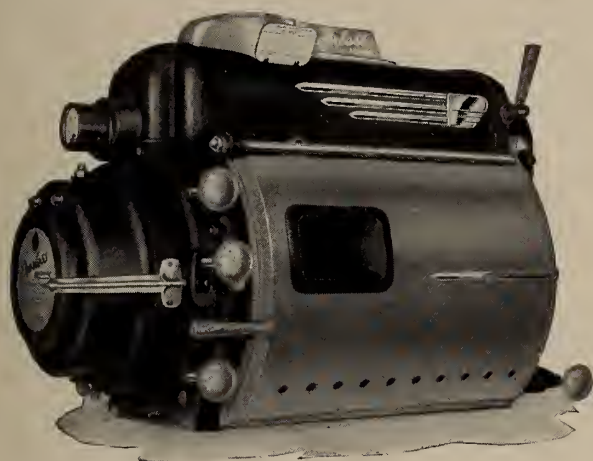
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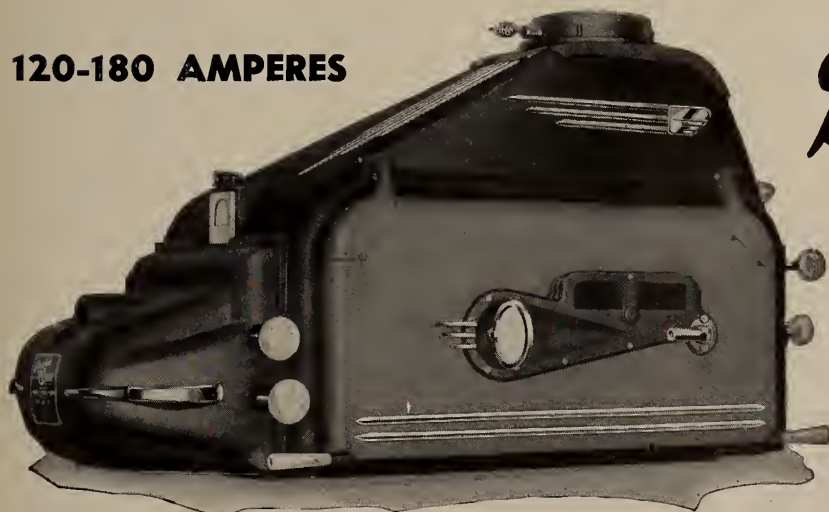


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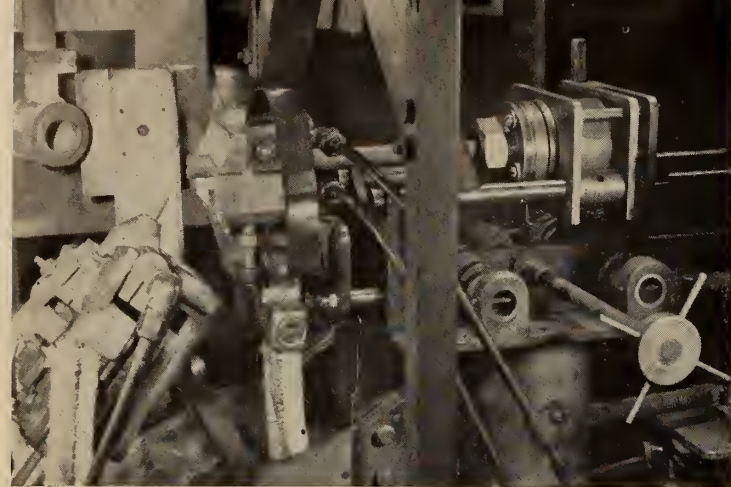


FIG. 1—Side view of arc-lamp mechanism incorporating water-cooled positive and negative jaws.



FIG. 2—Detailed view of water-cooled positive jaws on arc-lamp.

# High-Brightness Carbon Arcs<sup>†</sup>

By M. T. JONES and F. T. BOWDITCH

National Carbon Company, Cleveland, Ohio

**T**HE high-intensity carbon arc finds extensive use in the motion picture industry because of several important attributes. First, it has a very high brightness over an area of adequate size and shape. An effective light-collecting system thus can be designed to concentrate the necessary lumens on a projector aperture within the limits of optical speed which can be utilized effectively by the projection lens. Second, the light is of excellent color quality for the faithful photography and projection of both black-and-white and colored motion pictures. Third, the carbon-arc lamp has a high degree of mechanical reliability insuring a constant trouble-free delivery of light during the period required to project one reel, or to photograph a scene.

This first attribute of a continuously maintained high brightness has been the subject of investigation by many scientists both here and abroad. In our own laboratories, we are continually searching for ways of making and operating carbon arcs which will raise the ceiling of brightness, although we, in common with other investigators, have at times held the opinion that certain facts of nature have determined limits beyond which we may never be able to go.

## Basis for Water-Cooling

This article is concerned with a method of operating carbon arcs which has been found useful whenever the highest brightness and smoothest operation, particularly at high currents, is desired. This involves the use of water-cooled

jaws for both the positive and negative carbons. When these jaws are properly employed in a manner to be described, they permit the effective utilization of the high-current densities required for optimum high-brightness performance.

Mention has been made previously of the advantages inherent in water-cooled jaw operation. The continued confirmation and extension of these earlier findings has made appropriate this article devoted more particularly to a description of the operating methods involved.

## Critical Current Value

The major source of brightness in the high-intensity carbon arc is the so-called line radiation resulting from energy exchanges between rare-earth atoms and electrons in the gas ball within the positive crater. It is apparent that the higher

the current on a given-sized carbon, the higher the electron density in the crater will be. Thus a greater number of energy exchanges is to be expected, with a corresponding increase in crater brightness.

However, as the current is increased beyond a rather critical value, an overload phenomenon is encountered, which is usually characterized by noise and unsteadiness. In practical operation, therefore, the user must be content with the brightness obtainable at currents below this overload point. With the present 13.6-mm super high-intensity projector carbon, for instance, the maximum recommended current is 170 amperes.

A theory of overload has been advanced which, briefly, is analogous to the violent boiling of a kettle of water which accompanies a high rate of energy input from a turned-up burner. If, however, a cooling coil be inserted in the kettle (analogous to providing improved cooling of the positive-carbon crater) enough of the input energy can be absorbed

The effects of positive-crater cooling are described, and a suitable apparatus for this purpose is illustrated. The combination of specially made high-brightness carbons with water-cooled operation permits the use of higher currents without unsteadiness, and so gives a higher brightness than has been achieved in conventional air-cooled operation. This is attributed to the fact that effective cooling of the positive carbon removes energy which would otherwise be dissipated in turbulent volatilization, so that a higher current density can be achieved in the light-producing gas ball before overload turbulence occurs.

A considerable part of the more efficient crater cooling is attributable to the carbons themselves, since they will operate without water-cooling at higher currents and brightnesses than other types of equal size.

Within the limit of satisfactory air-cooled operation with a given carbon, efficient water-cooling always reduced the light produced at a given current; the ability to operate with higher brightness at higher currents was thus gained at the expense of a lower current efficiency. Carbons designed for efficient air-cooled operation gave no better result with water-cooling: the current efficiency was sacrificed with no gain in maximum brightness.

<sup>†</sup> J. Soc. Met. Pict. Eng., April 1948.

so that the boiling will subside, and an even higher rate of energy input tolerated without turbulence.

So it is with the carbon arc. Effective cooling of the positive carbon dissipates peaceably energy which might otherwise produce turbulence, so that a given-sized carbon can be designed to carry more current.

It has been pointed out that water-cooled operation is accompanied by a lower anode drop, so that this also contributes importantly to the reduction in anode energy per ampere. By means of optimum cooling, through the use of properly constructed carbons in water-cooled jaws, the gas ball in the crater space can thus be provided with a denser population of electrons before the limit of their peaceful absorption on the crater surface is attained.

A 13.6-mm size, for instance, can be made to operate at 350 amperes and 40,000 screen lumens, instead of 170 amperes and only 20,000 lumens; while water-cooled 16-mm carbons have been operated at currents up to 500 amperes. It is advantageous also to cool the negative carbon, particularly at high currents, as will be pointed out later.

### Crater Brightness vs. Consumption

Other workers have determined certain fundamental relationships characteristic of the carbons and methods of operation with which they were familiar, and which predict levels of operation significantly exceeded by the procedures described here. For instance, Finkelburg<sup>1</sup> reports an empirical relationship between crater brightness and consumption rate, which he found characteristic of the carbons and methods of operation available to him in Germany. At 2000 mm per hour (79 inches per hour) for instance, this relationship predicts an average brightness of 140,000 stilb (1260 candles per sq. mm.) As will be shown later, this value has been exceeded by about 50% by taking advantage of the cooling methods described in this paper.

In a second instance,<sup>2</sup> Hallett, in England, recently proposed a so-called "master curve," relating maximum crater brightness to current density. While Hallett and his associates were familiar with the advantages of water-cooled jaw operation, particularly as this affects carbon consumption, no mention is made of the ability, with specially made carbons, to achieve a much higher maximum brightness with water-cooled jaws than with the conventional radiation-cooled

contacts. By such means, we have found it possible in many cases to achieve brightnesses significantly in excess of the maximum predicted by the "master curve."

It should be pointed out again that this advance is not the result of water-cooled operation alone, since it will be apparent later that carbon design, specially directed toward water cooling, is an even more important factor.

The experimental apparatus in which our tests were made is shown by the succeeding figures. Fig. 1 shows a side view of the arc-lamp mechanism, which is a special adaptation of a general-purpose test lamp made by Mole-Richardson Co. The water-cooled positive and negative heads, made of silver and copper, respectively, the floating chuck for driving the positive carbon, and the arrangement of the current leads to protect them from the direct radiation of the arc and to insure a symmetrical magnetic field around the arc, are items of particular interest.

### Physical Testing Set-Up

The floating chuck at the right of the picture grips the positive carbon securely for purposes of rotation and forward feed, while at the same time permitting the end of the carbon to oscillate a bit as demanded by the rigid clamping of the front end. The water-cooling circuit, with a coil spring counter-acting the sideways loading which the piping imposes on the upper jaw, is another important feature.

This front-end clamping is more clearly seen in Fig. 2, which shows the positive water-cooled jaws with the near current lead removed, and the upper jaw raised to expose the construction features more clearly. These include a rigidly mounted lower jaw, with the upper jaw free to

move vertically under spring pressure. The location of the springs underneath, shielded from the radiation in a counter-bored hole in the lower water-cooled jaw, is an important feature.

The guides for positive alignment of the upper jaw insure the rigid clamping of the positive carbon along a predetermined axis. The upper jaw is sloped backward along the edge nearest the arc to permit free arc-flame travel at short carbon protrusion with minimum damage to the jaw.

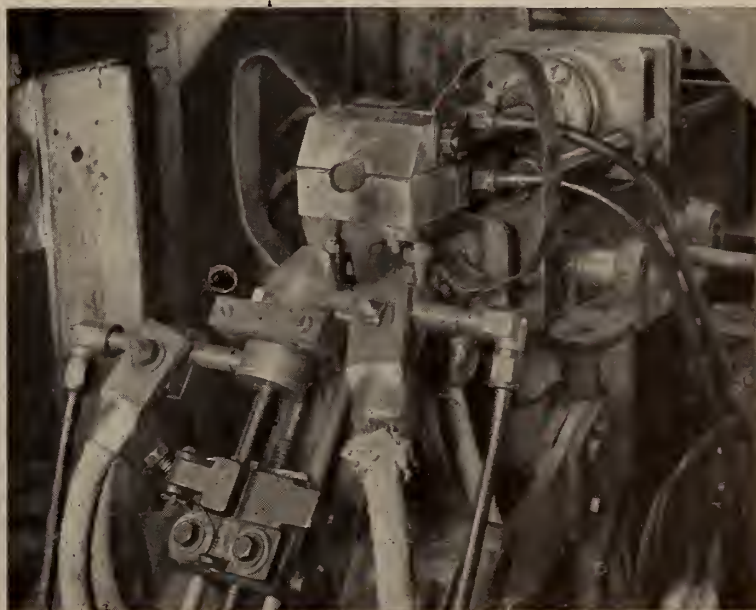
Figure 3 shows a front view of the mechanism with all connections, and both positive and negative carbons, in place. Special attention is directed to the negative head, which consists simply of a fixed-bore water-jacketed copper tube. An unplated negative carbon of small diameter (5/16 inch) is employed, with a short protrusion. Current is conducted directly from this water-cooled negative head, so that the carbon carries current only along the short protrusion.

### Positive Jaw Critical Area

The choice of silver material for the positive head and copper for the negative is based upon the following considerations. A material for this service must combine a high electrical and thermal conductivity with freedom from excessive corrosion and rapid wear in service. Copper most economically fulfills these requirements in so far as the negative head is concerned. However, this same material fails because of excessive wear in the positive head. This is because copper is plated from the jaws onto the carbon, and this then scores the jaws as it is dragged around with carbon rotation.

The reason this destructive effect is confined to the positive jaw, while the very similar usage in the negative gives

FIGURE 3  
Front  
view of  
arc-lamp  
mechanism  
equipped  
for water-  
cooling.



<sup>1</sup> W. Finkelburg, "The High-Current Carbon Arc," Field Information Agency, Technical, Office of Military Government for Germany (US). Final Report 1052. (Office of Technical Services P.B. No. 81644). Review published *J. Soc. Mot. Pict. Eng.*, vol. 52, pp. 112-113; January, 1949.

<sup>2</sup> C. G. Heys Hallett, "Recent developments in carbon arc lamps," *J. Brit. Kinematograph Soc.*, vol. 11, p. 188; December, 1947.

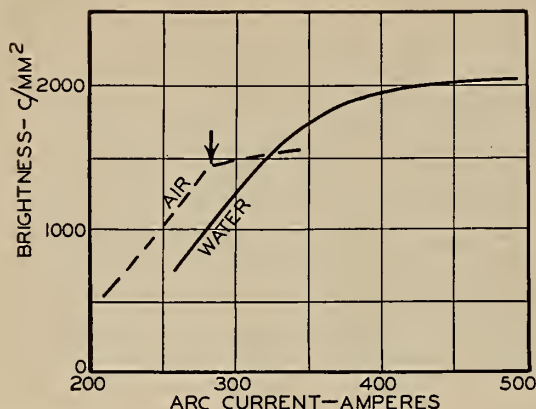
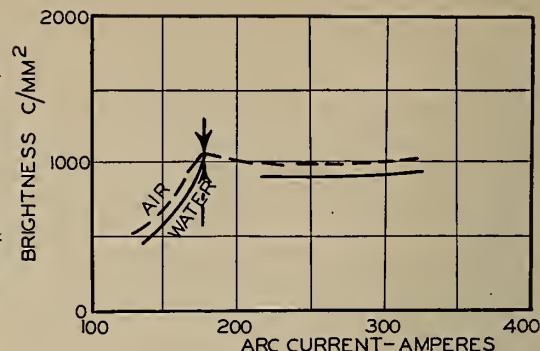


FIG. 4 (left): Comparison of air- and water-cooled operation for new higher-current 13.6-mm "high-brightness" carbon.

FIG. 5 (right): Comparison of air- and water-cooled operation for 13.6-mm super high-intensity projector carbon.



no trouble, is believed to be associated with the direction of current flow, and the rectifying action of the copper-oxide and sulfide films which tend to form along the copper-carbon contacts. These films are conductive in the direction of current flow from carbon to copper in the negative holder, but they tend to block current flow from copper to carbon in the positive.

Since the distance between the jaw and the carbon is so short, a contact drop of only 1 volt produces a gradient of perhaps several thousand volts per mm across the rectifying film. This is sufficient to rupture the film and draw copper ions across the gap to be neutralized on the carbon. Silver oxide and sulfide, on the other hand, are good conductors with no rectifying properties, and so silver is free from this difficulty. The jaws illustrated here have operated several hundreds of hours, many of them at high currents from 300 to 500 amperes, with no significant wear and every indication of prolonged satisfactory performance.

#### Carbon Rotational Speed

For purposes of securing comparative data, it is necessary that certain operating conditions be held constant. Factors determining the choice of these conditions in the tests to be described were as follows:

The speed of rotation of the positive carbon was chosen at 15 r.p.m. However, the exact speed is not critical so long as it is above the minimum required

to insure a straight crater face. In the test lamp used, the angle between the positive and negative carbon is adjustable over a wide range. This angle is not ordinarily critical over a range between about 45 and 60 degrees of the negative-carbon axis below a horizontal positive.

For the tests to be described, the half-way value of 53 degrees was chosen. At shallower angles, the positive tail flame is thrown objectionably close to the upper jaw, the arc is less stable, and it is more difficult to hold a straight crater. At steeper angles, the negative flame tends to pass in front of (rather than into) the crater, so that the arc is more difficult to control, at least without the aid of an auxiliary magnetic field.

In order to insure optimum cooling, the protrusion of the positive carbon beyond the jaw should be held to as small a value as possible consistent with adequate jaw protection. A protrusion of  $\frac{1}{2}$  inch was used with 16-mm carbons and only  $\frac{1}{4}$  inch with 9-mm carbons.

The use of a small negative carbon with a short protrusion contributes importantly to a stable arc at high currents. The small carbon spindles to a sharply defined tip area, which is completely and stably filled with the negative flame at a current density of approximately 30 amperes per sq. mm. (This compares with a positive-crater current density of between 1 and 3 amperes per sq. mm.)

It is obvious that there is much less

freedom for arc wandering here as compared with the comparatively blunt point formed on the much larger plated negatives conventionally employed in heavy-current service. The advantages of the small water-cooled negative are more pronounced as the current is increased.

#### Maximum Current Limits

The determination of the maximum performance of a given carbon is dependent upon the choice of a maximum operating current. This was chosen at a value a little below that which resulted in unstable operation. Over a wide range of sizes and types of positive carbons, the same 5/16-inch water-cooled negative was employed, giving very satisfactory operation at all currents from 90 to 500 amperes.

Positive carbons from 9 to 16 mm in diameter have been specially designed to take advantage of the efficient cooling provided in the apparatus shown in Fig. 1. The first of these is a 13.6-mm carbon operation at 290 amperes. One of the outstanding features of this type of carbon is its high thermal conductivity, which is essential to the efficient transfer of heat from the floor of the crater to the water-cooled jaws. This is an important link in the cooling system required to postpone overload turbulence to higher current densities, in accordance with the theories previously expressed.

Carbon composition, as well as water cooling, are thus involved in the achievement of crater brightness in excess of 2000 candles per sq. mm.

An interesting demonstration of this

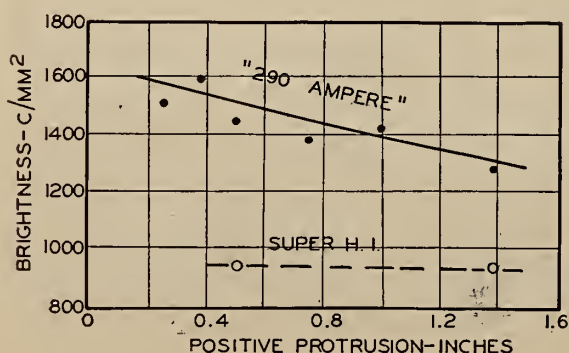
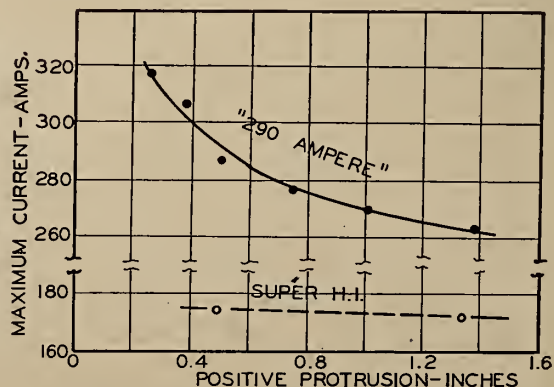


FIG. 6 (left): Effect of positive protrusion on brightness of 13.6-mm, "290-ampere" and super high-intensity projector carbons.

FIG. 7 (right): Effect of positive protrusion on current capacity of 13.6-mm, "290-ampere" and super high-intensity projector carbons.



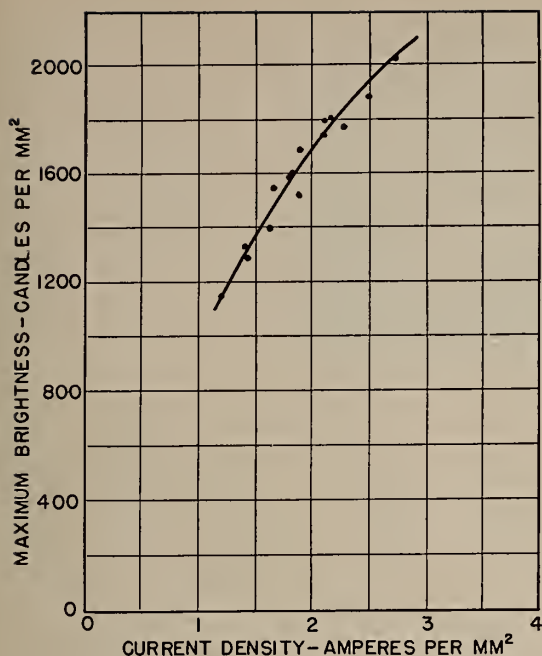


FIG. 8 (left): Brightness variation with current density for "high-brightness" carbons.

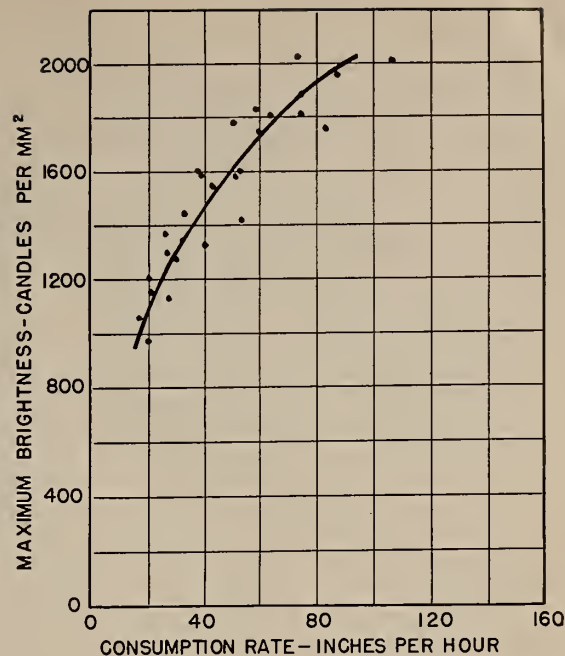


FIG. 9 (right): Brightness variation with consumption rate for "high-brightness" carbons.

fact is given by a comparison of the two following figures. Fig. 4 shows the relationship between crater brightness and arc current for a new higher-current 13.6-mm carbon when operated first in water-cooled jaws at  $\frac{1}{2}$ -inch protrusion, and then in conventional air-cooled jaws at  $1\frac{1}{2}$ -inch protrusion.

The outstanding feature of the water-cooling, combined with the shorter protrusion which this makes possible, is the ability to carry much higher currents than with air cooling, and to attain higher brightness as a result. Within the limits of satisfactory air-cooled operation, however, the carbon reaches a higher brightness at a given current than when water-cooled, so that the current efficiency of the carbon is reduced by water-cooling.

#### Not Common to All Carbons

The ability to carry higher currents with water-cooling is not characteristic of all carbons however. To illustrate this the performance of the 13.6-mm super high-intensity projector carbon, representative of the usual type of carbon, is shown in Fig. 5. Here water-cooling in no case produces a higher brightness than can be obtained with air-cooling, and the current efficiency is always less. Thus with this, as with most conventional types of carbons, water-cooling has no such advantage in increasing brightness as is exhibited by the "high-brightness" carbon of Fig. 4.

Referring again to Figs. 4 and 5, it will be noticed that sharp breaks occur in three of the four curves in the two figures at the points indicated by the vertical arrows. These are the currents at which the carbon "overloads," with the accompanying hissing and sputtering which is familiarly encountered in such cases. At higher currents, the arc is

noisy and generally unsteady, prohibiting operation under practical conditions.

It is the practice, of course, to operate a carbon at a current somewhat below this "maximum" value at which overload occurs. The 13.6-mm super high-intensity projector carbon, for example, overloads at about 176 amperes, whether water- or air-cooled, so that 170 amperes is the recommended maximum operating current for this carbon. The high-brightness carbon (Fig. 4) reaches a similar overload condition at 282 amperes when air-cooled.

#### Varying Characteristics of Carbons

However, in interesting contrast to the usual types of overload, this carbon does not behave in the manner just described when water-cooled, even at currents up to 500 amperes. It operates quietly up to about 325 amperes. At higher currents, the light remains steady, but a sort of droning noise gradually develops, which is altogether different in quality and much lower in intensity than with the conventional type of overload, and quite tolerable in many applications.

We have found this clear-cut difference to exist to the extent described only with carbons having relatively thin shells (less than 2 mm thick with the 13.6-mm carbon). High-brightness carbons having thicker shells (of which the 13.6-mm "290-ampere" carbon is an example) exhibit tendencies toward the hissing type of overload common to usual types of carbons, so that their "maximum" current is fairly well defined.

Another manifestation of the unique properties of the high-brightness type of carbon is the relation of brightness and of arc current to positive protrusion. Figs. 6 and 7 show these relationships for the 290-ampere, 13.6-mm car-

bon. As the protrusion is lessened to give improved crater cooling, the "maximum" current and the brightness increase. The usual type of carbon, exemplified again by the 13.6-mm, super high-intensity positive carbon, exhibits little or no change in brightness and "maximum" current with change in protrusion.

High brightnesses have been obtained with these special carbons at significantly higher current and carbon efficiencies than have been reported by other investigators. For instance, the maximum performance predicted by Hallet<sup>2</sup> is exceeded by all of the 15 high-brightness carbons for which the data are plotted on Fig. 8. These carbons are from 9- to 13.6 mm in diameter and exceed the predicted performance at a given current density by as much as 10%, although the general shape of Hallet's master curve is followed quite well.

Another interesting property of these carbons is their ability to produce a much higher brightness at a given consumption rate than was characteristic of the carbons which Finkelburg<sup>1</sup> examined in Germany. Data on many of our high-brightness carbons ranging in size from 9- to 16-mm and burned in water-cooled jaws are plotted on Fig. 9. The brightness at a given consumption rate exceeds that reported by Finkelburg by more than 50% in all cases.

#### Discontinue Beryllium in Lamps

Effective June 30, major manufacturers of fluorescent lights will stop using *beryllium phosphor*, which has been established as a menace to health even if only inhaled, much less introduced into a body wound. G. E., Westinghouse and Sylvania lead the way, with other manufacturers expected to follow suit shortly.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**D**EATH claimed two outstanding personalities within the IA during the past month when William C. Elliott, former international president, and Louis Krouse, who upon his retirement in 1945 was general secretary-treasurer, were stricken fatally within four days of each other—Elliott on June 15, and Krouse on June 19.

Bill Elliott joined Cincinnati Local 5 in 1902 and early displayed a liking for road shows, probably the most noted of which were the Maude Adams tours which he served for a considerable time as an electrician. Bill was a stagehand from his finger tips to his toes, and he often asserted that the typical stage crew could "build anything anywhere—often with little or nothing—and make it serve its intended purpose."

Bill's rise in the Alliance was as speedy as some of his road jumps were long, for after first being named a delegate to the Cincinnati Convention of 1922, he was selected by the general executive board to be 5th IA vice-president to succeed Ed Tinney, who resigned in 1923 to take the post of IA representative.

Eight years later—on December 9, 1931—International President William F. Canavan resigned from office and Bill Elliott was named by the Board to succeed him. These depression years were productive of considerable unrest, and in some instances actual strife, within labor's ranks, and Elliott was handed more than his share in both the production and exhibition branches of the industry. His term of office also witnessed the adoption and the first fumbling operations of the National Recovery Act—the famed NRA—and this added no little to Bill's burden.

He carried the ball and absorbed the inevitable pounding which is the lot of a man in such a position until the Louisville Convention of 1934, when he resigned to return to his former post as business manager of Cincinnati Local 5. He held the latter office all through the intervening years and attended every IA Convention in the interim.

Bill's genial disposition and open-hearted frankness won him a host of friends within and without the Alliance, and the record shows that he faced up to

many tough situations with courage and determination. His absence from the next IA Convention will be marked by many of his fellow workers, and that's about the best recommendation any man can have. He is survived by his widow and a daughter.

ALTHOUGH LOUIS KROUSE is more widely remembered for his association with the IA general office, the real old-timers will recall him as the fledgling delegate to the Seattle Convention in 1913 who sponsored the famous Resolution No. 9 which paved the way for the granting of full charters to projectionist locals.

In 1909 Krouse represented the Moving Picture Operators Auxiliary of Philadelphia Local 37. In 1913 he was named a convention delegate, and it was at Seattle that he obtained unanimous approval for the resolution which conferred separate charters and full autonomy to operators' locals, the forerunner of all such charters. His own Local was No. 307, Philadelphia.

Lou never missed an IA Convention from 1913 down to 1944, when he was incapacitated by the illness which he endured until his death on June 19 last. At Cleveland in 1917 he was elected 5th IA vice-president, a post which he resigned after a few months when he was named an international representative by President Charlie Shay. Lou remained a representative for 15 years until 1932, when he was appointed assistant international president by President William C. Elliott. He succeeded the late Fred J. Dempsey as general secretary-treasurer, which office he held until his retirement in 1945.

Lou was an organizational workhorse, and during his 28 consecutive years of IA service witnessed the influx of more locals and new members into the Alliance than any other national officer. One of his outstanding jobs was as coordinator of the NRA Motion Picture Code.

Lou's funeral was attended by many officers and members of the general office and the various locals. He is survived by his wife, Ida, and two sons, Morton and Theodore, the latter a medical doctor who is also a member of Local 307.

• Detroit, Mich. was the scene of the recent two-day meeting of District No. 8. Don Barnecko, business agent of Indianapolis Local 30, was elected District secretary, succeeding Arthur Lyday, business agent of Indianapolis Local 194, who retired after holding the office for about 20 years. Harland Holmden, 1st IA vice-president and business agent of Cleveland Local 160, presided.

Among the IA officials attending the meeting were John B. Fitzgerald, international representative and member of Cleveland Local 27; Roger B. Kennedy, 5th vice-president and business agent of Detroit Local 199, and the late William C. Elliott, past IA president and, at the time of his recent death, business agent of Cincinnati Local 5.

• We were extremely interested in an item appearing in the labor press relative to the employer-financed old age pension plan of the ILGWU (International Ladies Garment Workers Union) which has a membership of 85,000. This plan, effective June 1 last, assures each member a lifetime pension of \$65 per month.

We should like to compare this with the retirement fund of Chicago Local 110, with a membership of about 700, which provides each member with a lifetime pension of \$100 per month, plus additional benefits. A five-year pact between Local 110 and the exhibitors, effective September 1, 1948 (see IP for Aug. 1948, p. 17; Feb. 1949, p. 19), providing for a welfare fund for the union membership, was hailed throughout the Alliance as the forerunner of a new trend in theatrical employer-labor relations. Gene Atkinson, business manager for the Chicago Local, has once again paved the way for beneficial agreements between other IA Locals and exhibitors.

• Bert Penzien, for many years business agent of Local 735, Mt. Clemens, Mich., resigned from office to devote more time to his new television venture.

• New England District No. 3 held its annual meeting last month at the Hotel Bradford in Boston. The assembly was addressed by IA President Walsh, General Secretary-Treasurer Raoul, and As-

sistant President Shea, who spoke on matters pertaining to the industry at large. The convention endorsed the re-appointment of Benjamin G. Hull, member of Springfield Local 186, as associate commissioner of labor in Massachusetts.

William C. Scanlan, IA trustee and secretary-business agent of Lynn Local 73, presided at the conclave, replacing James J. Brennan, 4th IA vice-president, who was scheduled to preside but was hospitalized at the time. Brennan has since left the hospital and is now recuperating.

- A scallion to the source who sent us the item last month erroneously stating that Grant Johnson, who presented Dick Green with a gold life membership card in Chicago Local 2, was president of the Local. How this error slipped through is beyond our understanding, for the president of Local 2 for the past five or six years is Bill Oke, a very good friend of ours.

- Joe Davis, member of New York Local 306 and past president of the Theatrical Square Club, is spending his vacation visiting the various studios on the West Coast.

- Local 178, Salisbury, N. C. is mighty proud of its president and former business agent, Marshall Ramsey, who was recently elected to the city council. Marshall is also secretary of the North Carolina State Federation of Labor and of the State Council of IA Locals. James

B. Mahaley was elected business agent of the Local, succeeding Marshall.

- A recent note from C. Mills, secretary of Local 105, London, Canada, advised us of the death of George (Newt) Wallis, former president of the Local. Last month we reported that Newt had suffered a relapse while apparently recovering from a serious operation. Services held in St. Thomas Church were conducted by the Rev. J. Fleck, assisted by the Local's vice-president, T. Robertson. Worshipful Master of Lodge No. 44, A. F. & A. M.

- The meeting of the Tri-State Association held in Fairmont, W. Va. last month was the occasion of a dual celebration: the Tri-State organization observed its 25th anniversary, while Fairmont Local 239 celebrated its 37th. A record attendance marked this convention, with more than 125 representatives and guests from the 35 member locals being present. President Walsh, General Secretary-Treasurer Raoul, and Assistant President Shea were among the IA executives present.

F. P. McCoy, secretary of New Kensington Local 444, was re-elected secretary of the Association. Erie, Penna. was chosen as the site for the 1950 meeting.

- The brothers Storch, Nat and Albert (Skippy), members of Local 366, Westchester Co., N. Y., are spending their vacations cruising in South American waters. Nat, who is president of the

## NAMED BRONX SCHOOL BOARD MEMBER



Morris J. Rotker, member of New York Local 306, was recently sworn-in by Borough President Lyons (left) as a member of Local School Board 18, Bronx, N. Y. Rotker has been a member of 306 since 1914, has held many offices in the Local, and is a past president of the 25-30 Club. He recently celebrated his 35th wedding anniversary.

Local, was electrician for the popular musical "High Button Shoes," which recently closed a successful Broadway run. Skippy is soundman with the stage hit "Mr. Roberts."

- R. E. (Rut) Morris, secretary-business agent of Local 142, Mobile, Ala., was re-elected secretary of the 7th District at the recent annual convention. The meeting, held in Chattanooga, Tenn., was attended by top IA officials.

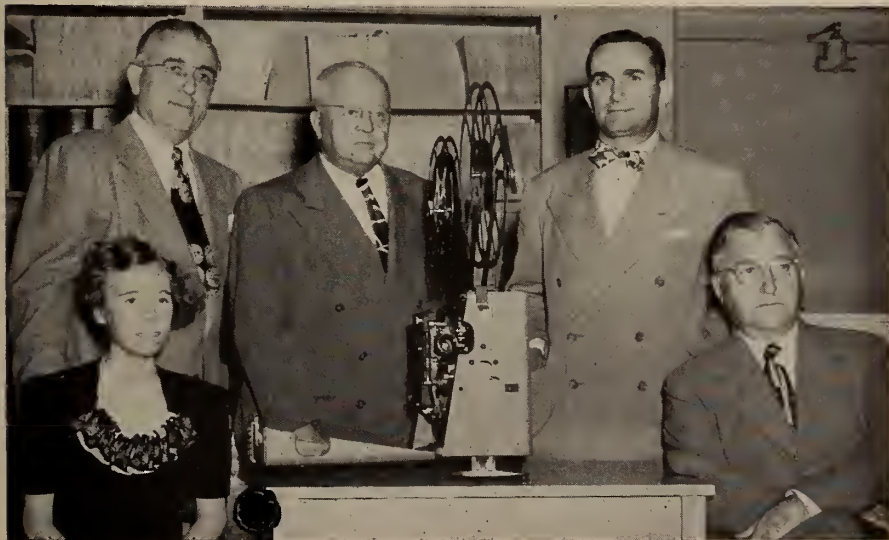
- Morris J. Kravitz, business agent of New York Local 306 since 1942, died last month several hours after he collapsed on the street. Morris was stricken with partial paralysis several years ago, but despite his physical handicap he continued with his official duties.

Steve D'Inzillo, who pinch-hit for Kravitz when the latter was first stricken, was appointed temporary business agent by Herman Gelber, 306 president.

- Recent out-of-town visitors to the offices of IP: Gene Atkinson and Clarence J alas, business manager and secretary, respectively, of Chicago Local 110; Father Robert A. Boelcke, head of the science department of St. Mary's College, North East, Penna.; Jake Pries, business agent, Atlanta Local 225; Jack Behlke, field man for Motiograph; John Shuff, business agent, Local 364, Akron, Ohio. Paul Baron, Local 302, Calgary, Canada, and Herbert Schell, secretary-business agent of Local 12, Columbus, Ohio.

- Mississippi's "blue-law" banning Sunday movies received a setback recently when despite the arrests of 22 theatre employes—managers, ticket-takers, cashiers and projectionists—the show still went on. Substitute projectionists took over when the regular men were booked on charges.

## CHICAGO LOCAL 110 PRESENTS FIRE HEROINE WITH MOVIE PROJECTOR AND FILM



Fully recovered from the serious burns sustained when she heroically risked her life to save those of her brothers and sisters from a fire which destroyed the shack in which they lived, Roberta Lee Mason views the film record of the building of a new \$17,500 "Dream House" built by the people of Chicago through the combined efforts of all building trade unions.

IA Local 110's contribution to the project, in accordance with a promise made by Gene Atkinson, business manager, was a complete film record of construction activities and a complete sound projection equipment. Shown here at film's preview are (seated) Miss Mason and Dr. Karl Meyer, Cook County Hospital, and (standing) Gene Atkinson, Dr. Ole Nelson, of the hospital staff, and Fred Hertwig, hospital warden. Prints of the film will be shown in the Chicago schools and at union meetings.



# TELECASTS

## Direct Fight Pickup Proves Theatre Tv Feasibility

**T**HEATRE-Tv proponents made with the chest-puffing and cock-crowing following the recent direct pickup of the Walcott-Charles heavyweight fight in Chicago for showing on the screens of the Paramount, Times Square, and the Fox, Brooklyn, theatres. The latter utilized the RCA instantaneous projection equipment to produce a 15 x 20-foot image, while the Paramount employed its own intermediate film-storage system in which the Tv image is photographed on film, developed and projected via the regular theatre equipment within a minute.

The Fox played to SRO, with 4500 tickets being sold for a 4060-seater, and announcement being made that the house could have been sold out twice over. The Paramount failed to sell out, despite the proximity of the Times Square fight mob who were expected to pack the house. Both theatres added the fight to their regular programs at no advance in price.

Events at the Fox showing are of particular interest to projectionists. The Tv projector was installed in the loge, as was the control unit, although the latter would have gone into the projection room if the run of coaxial cable had been long enough.

### IA Men Install, Run Show

Installation of the Tv units was made jointly by members of IA Stagehands Local 4 (Brooklyn) and RCA engineers, in addition to standby projectionist members of Local 306 (N. Y. City). Standby time was split up as follows: one man for 13 hours and a two-man crew for 11 additional hours.

Actual operation of both the Tv projector and the control unit was handled by the regular theatre projection crew of two men. Joe Lieberman, RCA engineer in charge of the installation and operation of the equipment (also a member of Local 306) stated that "everything went off perfectly." RCA officials present at the showing are credited with the statement that the same policy with respect to the use of IA men—stagehands and projectionists—will be followed wherever similar showings are given.

The equipment used at the Fox utilized a 20-inch mirror and a 15½-inch plastic lens having a combined weight of only 50 pounds as contrasted with the 500-

pounds weight of the optical system used last year. A smaller optical barrel, only 30 inches in diameter and 36 inches long, is now the only equipment required in the theatre auditorium, and for a 15 x 20-foot screen image this barrel may be mounted 40 to 65 feet from the screen.

Harry Garfman, Brooklyn business representative for Local 306, really merited the kudos he received for his smart handling of this situation.

Theatre Tv has proved its complete feasibility technically; but there still remains the question of programming in terms of how many special events with the "pull" of the Walcott-Charles fight are available through the year—particularly when such events are as overflowing cream for the pudding of the regular theatre film program.

### TOA to Act on Theatre Tv

Agreement has been reached between the theatre Tv committees of the SMPE and the Theatre Owners of America that if exclusive Tv programs are to be sent by radio the motion picture industry must prove its radio channel needs to the FCC within the next three to five months. Exhibitors may ultimately provide their own radio facilities or buy service from a common carrier, but either way FCC approval and channel allocation is required.

Engineers speculate that the forthcoming allocation of new Tv channels will force broadcasters and other services to request additional channels which are now earmarked for experimental theatre Tv. Time for the decision on radio vs. cable distribution of theatre Tv programs is running out because others will soon be able to prove their need for this air space. Failure to convince the FCC now will leave only cable for distribution, which may prove to be wholly uneconomical.

### Cost Data Imperative

To sound out comparative costs between common carrier and private distribution as well as cable vs. radio, TOA plans to confer with A.T.&T. on inter- and intra-city program exchange.

Theatre owners who have experimented with theatre Tv agree that cost of equipment, although high when compared to

conventional motion picture projectors, is small when compared to the cost of Tv programming. Program rights, talent, studio facilities and remote pickup are among the incidental charges that must be included.

In a serious attempt to develop accurate cost information and to learn just how Tv will best tie-in with motion picture theatre entertainment, a group of 40 to 50 theatres is now considering the experimental installation of Tv. Further SMPE and TOA meetings will be held prior to the convention in Los Angeles in September.

### Remote-Control Tv Brightness Unit

A remote-control attachment, permitting the Tv viewer to control the brightness and contrast of a receiver from his armchair or other locations in the room, is incorporated in RCA's newest big-screen, projection-type Tv receiver.

The remote-control unit is contained in a small wooden box which can be connected with the receiver by a 25-foot length of wire which can be run inconspicuously under the rug. Dual knobs on the box permit adjustment of screen brightness to suit the observer's preference. The 300-square-inch (15" x 20") screen can be lowered into the cabinet when the set is off.

### Biggest Tv Set Sales Inroads Among Movies' Prime Patron Group

Families in the middle and lower income groups—backbone of the movie audience—possess 58% of the Tv sets in use today, according to the results of a Sylvania Electric Products survey. It was shown that the rate of purchase of families making less than \$5,000 yearly is mounting much faster than that of those taking in more than \$5,000.

Sylvania reported that among families making less than \$2,000 ownership of Tv sets had gone up 50% from December, 1948, to February, 1949, the increase being 33% among families earning up to \$5,000 and 30% among those in higher brackets.

The survey was made during the last week of February and the first week of March in 13 cities that have had video available for different lengths of time.

**Your Best Buy . . .**

**U. S. SAVINGS BONDS**

IN THE iridescence of an oil film on a wet city pavement and in the colors of a soap bubble in the sunlight, science and industry have the key to the most precise and delicate direct measuring method known.

"It has been observed by others, that transparent substances, such as glass, water, air, etc., when made very thin by being blown into plates, do exhibit various colours, according to their various thinness, although at a greater thickness they appear very clear and colourless." So wrote Sir Isaac Newton in the last quarter of the 17th Century, and then he sets about describing a series of experiments in what we now call physical optics which have not been surpassed in ingenuity to date. Considering the crudity of his apparatus, the accuracy of his results is amazing.

#### **Incredible Precision Required**

The dimensioning of mechanical parts for high-grade optical apparatus is very precise. For instance, the lens separations in a modern microscope objective are specified in thousandths of a millimeter, or microns, one of which equals 0.00004". But for gauging optical surfaces on lenses, prisms, and reflectors, the micron, small as it is, is still too large. Here recourse must be taken to fractions of the wavelength of light.

The optical engineer assumes and the skilled optical craftsman attains in routine production accuracies of curve to 0.000 006" and can exceed in fineness 0.000 000 8" when instrumental applications require.

How can optical work be measured confidently with such delicacy? "It's very simple," says the experienced lens grinder and polisher. "I measured it by Newton's Rings and it's within a quarter or a tenth or a thirtieth of a wavelength." In the color phenomena of thin wedge films he has a means for measuring the accuracy of transmitting and reflecting surfaces in units which, though real, are so small as to be almost inconceivable.

#### **Newton's Pioneer Calculations**

Each time such a measurement is made, the classical experiments of Newton are duplicated. Newton was not the first to observe the formation of colored areas in the thin film of air between two polished plates, or in thin layers of water as in soap bubbles, or thin plates of glass, mica or pitch. Nor was he the first to propose an explanation. Robert Boyle and Hooke, the microscopist, both preceded him. Neither one, however, provided an explanation on a definite quantitative basis.

"To observe more nicely the colours" under controlled conditions, Newton placed the plane surface of a plano-con-

# Newton's Rings: Yardsticks of Optical Science

Scientific Bureau  
Bausch & Lomb Optical Company

*Frequent mention of the term "Newton's Rings" in articles anent projection optics appearing in these columns evoked not a few inquiries from readers as to the meaning of this expression. This article, it is hoped, will satisfy this interest.*

vex objective from a 14-foot telescope on the convex surface of a bi-convex objective from a telescope of about 50-foot focus, thereby forming a thin film of air which gradually increased in thickness from zero.

Upon observing this arrangement by reflected light, at the center where the surfaces were in contact he saw a black circular spot about which was a series of bright and dark concentric circles. In white light the bright rings were colored. In red light the rings were larger than when viewed in blue light. By calculating the distance between the glass surfaces he was able to determine the air film thickness responsible for each color.

Ingenious as was Newton's Corpuscular Theory, it finally lost ground in the face of the Wave Theory as sponsored by Huygens, Young and Fresnel.

The modern explanation of Newton's Rings is based upon the assumption that light consists of periodic disturbances which, regardless of their frequency, travel at the same speed in any homogeneous medium.

It can be visualized somewhat imperfectly by the mechanical analogy of water waves which would be formed by touching a tuning fork or vibrating reed to a liquid surface. With such a set-up ripples would radiate in all directions from the point of contact.

If the fork was of low note, fewer waves would be radiated per second than if a higher note fork were used. The distance between the crest of one wave to the crest of the next would be the wavelength in either case. Obviously the low

note fork would produce the longer wave.

Using two forks of identical vibration rate, it would be possible to find a position where the waves from one fork would dampen out or nullify the waves from the other. Another position could be found where the waves from one fork would accentuate the waves from the other. In the first case the waves would be out of step or phase. In the second case the waves would be in step or phase.

#### **Formation of Newton's Rings**

With light we have a condition somewhat similar. A body giving out visual light radiates energy in wave-form, in which the distance from crest to crest ranges from about 0.0004 to 0.0008 mm and which travels at the rate of approximately 300,000,000 meters p.s. in air.

It should be noted that interference of light waves emanating from different sources has not been demonstrated experimentally, possibly due to the extremely high frequency making synchronization very unlikely. However, light waves from the same source can be made to interfere under certain conditions, one of which is that responsible for the formation of Newton's Rings.

Let us assume that we have the same experimental arrangement as set up by Newton, namely a convex surface of very long radius and a plane surface enclosing a very thin film of air. As an illuminant we will use a source radiating light of one wavelength.

On looking at the enclosed air film from above we will see a central dark spot surrounded by alternate bright and dark circles. If we looked through the air film, we would see just the opposite, a central bright round area surrounded by alternate dark and bright circles.

#### **Path of Reflected Rays**

Due to the very slight difference in curvature, the air film at any point can be considered as essentially plane parallel. We neglect all reflections except those at the enclosed air film-to-glass surfaces. These conditions are diagrammed in Fig. 1.

A portion of the ray of light coming  
(Continued on page 23)

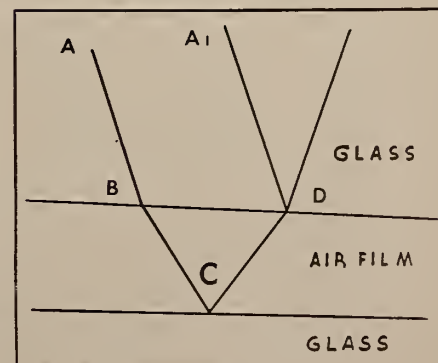


FIGURE 1

## Century Projector Develops Water-Cooled Aperture Unit

CHARACTERIZING the move as a "return to first principles," Century Projector Corp. has announced the availability of water-cooled apertures on their Models C (single-shutter) and CC (double-shutter) projectors as a means for overcoming the serious effects of the ever-increasing wattage used for carbon arc lamps. Among the improvements effected by this unit, says Century, is the elimination of film buckle, hot film trap shoes and sticking film emulsion even on new green prints.

The use of higher arc currents with this unit is held by Century to permit the projection of full-brilliance screen images without the loss of light, definition or of wasted power. Century avers emphatically that neither forced air cooling nor carbon water-cooling will serve to reduce film temperature and thus eliminate distortion caused by buckling.

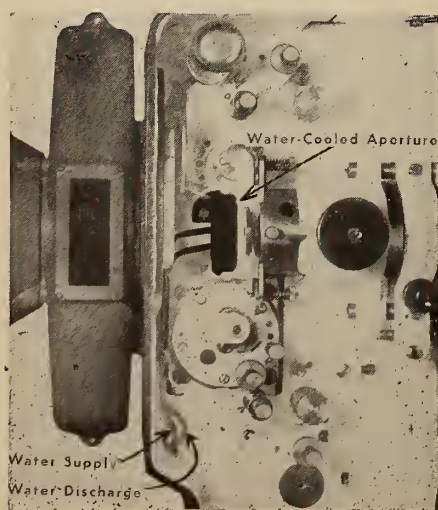
### Details of Cooling Setup

Century water-cooling is accomplished by a water cell placed directly in back of the film trap through which flows approximately  $\frac{1}{2}$  pint of water per minute. If water-cooling is also used in the lamphouse for the carbons, the same water line may be extended to the aperture, thus simplifying the installation.

A re-circulating water system, to be ready shortly, will require no regular flow of water and will be fully automatic in operation.

Standard  $\frac{1}{4}$ -inch pipe connections are used; also, standard  $\frac{1}{4}$ -inch fittings are provided for the intake and outlet of water at the base of the projector mechanism. The  $\frac{1}{4}$ -inch pipe, couplings, reducing fixtures, rubber hose, attachments, etc., are readily available at all plumbing supply houses, or they may be obtained through Century.

Century Model CC projector (light shield removed) showing water-cooled aperture, water supply, and discharge pipes.



The cost of the Century water-cooling unit per *each* projector is \$90 list, bearing on which point Century asserts the following advantages may be realized:

### Cite Advantages of Cooling Unit

1. The new high-intensity and, especially, the super-high arcs may be used without the need for glass heat filters or blower attachments.
2. Light losses of upward of 20% are recovered.
3. Initial investment (lower-amperage lamps and auxiliary units) and operating costs are reduced substantially, with Century asserting that the same amount of screen light can be obtained with the water-cooled aperture at a saving of more than \$3000 annually per two-projector installation.

Century emphasizes the point that while the water-cooling unit was designed primarily for arc amperages ranging from 80 to 180 amperes, it may be used with comparable advantages in any arc setup, the basic principles being applicable under any circumstances.

## New Improved Magnets for Both Models of Peerless Lamps

Two new adjustable arc stabilizing magnets—for the high-current Hy-Candescent lamp and for the Magnarc model—have been announced by J. E. McAuley Mfg. Co., manufacturers of Peerless arc lamps. Not only are these new magnets now standard equipment on all Magnarc and Hy-Candescent lamps, but McAuley urges that they be substituted for other magnets now used on *all* Peerless lamps.

The changeover to the new magnet on either type lamp is a very simple operation, with absolute satisfaction and greatly improved operation indicated as a result of exhaustive tests conducted by McAuley over a long period of time both at the factory and in the theatre field.

### The Magnarc Adjustable Magnet

The Magnarc magnet is made of cast Alnico. It is a double bevel end, bar type. It is adjustably positioned, well above the axis of the carbons, so that the entire magnetic flux force is exerted

against the arc crater and its gasses, with an impressing effect.

Provision is made so that the magnet's flux field can be adjusted in directions parallel to the positive carbon crater face and also toward or away from the crater, coaxial with the carbons. The method of mounting also permits a tipping adjustment, in a horizontal plane, and hence complete control of the burning arc characteristics is attained.

### The Hy-Candescent Magnet

The new Hy-Candescent magnet provides means for the complete control of the burning characteristics of high-current, high-intensity arcs, and assures correct orientation of the several types of arc flames into a single coalesced tail flame, promoting thereby a higher ratio of light lumen per arc watt of current across the arc.

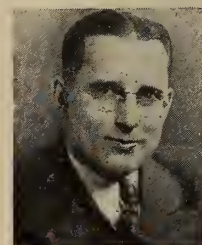
It also makes possible absolute control of the sweeping upward angle of emanation of the positive tail flame, and this coaxial with, and crossaxial to, the axis of the positive carbon.

Detailed specifications anent these units, including precise drawings and installation data, are available from McAuley, 554 W. Adams St., Chicago 6.

## Larry Davee Named Chairman of SMPE Projection Committee

L. W. (Larry) Davee, sales manager for Century Projector Corp., has been appointed chairman of the SMPE Projection Practice Committee. With a record of 20 years membership in the Society and active participation in many of its engineering committees, Davee is expected to revitalize the

L. W. Davee,  
Chairman of  
the SMPE Projection  
Practice  
Committee.



Projection Practice Committee, recent activities of which have been on a somewhat restricted basis.

Foremost on the list of projects to be undertaken by Davee's committee, following a shakeup of personnel to effect maximum effort, is a revision of existing projection room plans which will serve as a model for both planning new rooms and modernizing existing structures. Special attention will be given to the needs of both direct and film-storage types of Tv. Noteworthy will be the preparation of recommended paragraphs to be included in theatre specs by all architects and theatre builders. Standards for 35-mm projection reels will also receive major attention.

Intimately identified with projectionists, Davee is an honorary life member of the 25-30 Club of N. Y. City.

## IA ELECTION

### LOCAL NO. 285, TROY, N. Y.

Charles H. McCarthy, *pres.*; James J. Kelly, *vice-pres.*; Earl Cooney, *rec.-sec.*; Vincent J. Iannacito, *fin.-sec.*; Jesse Lohman, *treas.*; George L. Nugent, *bus. mgr.*; Thomas Norris, *sgt.-at-arms*; James J. Kelly, John Ross, Leland Day, *trustees*; McCarthy, Cooney, Nugent, Lohman and Kelly, *exec. board*.

## 19,323 Theatres Operating in U. S.

Theatres operating in the U.S. as of January 1 last totaled 19,323, according to the 1949 edition of the *Film Daily Year Book* now being distributed. On the same date there were 745 theatres closed "temporarily," thus making the total theatres in the country 20,068.

Total includes 983 Drive-In theatres and 916 theatres operated principally for Negro patronage. There are motion picture theatres in 10,087 U. S. cities and towns, including 175 places where films are shown with portable projection equipment.

American theatres include a total of 12,071,311 seats, of which 11,722,616 are in theatres operating as of Jan. 1, and 348,695 in houses not operating on that date.

### 91,281 Theatres Throughout World

Motion picture theatres throughout the world totaled 91,281 as of Jan. 1, according to the *Year Book*. Seating capacities of the theatres aggregated 39,067,196.

Breakdown of world theatres shows, in addition to 20,068 in the United States, 54,071 in Europe; 6386 in Central and South America; 2900 in the Far East; 2183 in the South Pacific; 1862 in the Middle East; 1207 in Africa; 659 in the Caribbean area; 122 in the Atlantic Islands; 1693 in Canada, and 130 in Puerto Rico.

### SMPE N. Y.-Chicago Joint Tv Meet

The first joint meeting by Tv of a technical society was staged by the SMPE on June 28 when the Atlantic Coast Section program held at the Adelphi Theatre in New York was broadcast over five DuMont affiliated Tv stations including WENR-TV Chicago, where it was viewed by the Mid-West Section. More than 600 attended the New York meeting, while the Chicago turnout exceeded 500.

Topic of the hour-long program was lighting methods for Tv, the time being split about equally between "live" and sound-film fare. Chicago reported excellent reception.

### I. Nixon, B. & L. Executive, Dies

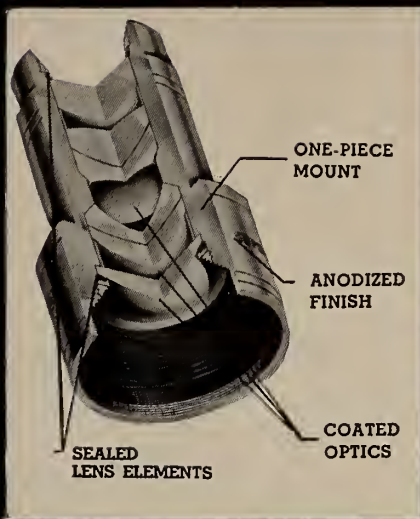
Ivan L. Nixon, 66, associated with Bausch & Lomb Optical Co. for more than 40 years, died on June 25 after a brief illness. At the time of his death he was vice-president of B. & L. in charge of the Scientific Instrument Division. He contributed materially to the development of many types of scientific instruments, including Balopticons, photomicrographic and metallographic equipment, contour measuring projectors, and motion picture camera and projection lenses.

During World War II Mr. Nixon handled most of B. & L.'s military contracts for optical gunfire control equipment.

### Technicolor 1948 Profits Up Sharply

Technicolor set new high marks in total sales and in profits during 1948. Sales hit \$20,016,066 and net profit was \$1,775,834, equal to \$1.93 per share. Company's expansion program designed to double annual capacity to 320 million feet permits the de-

## f/19 SUPER-SNAPLITE



Question Box

No. 6

### HOW IS IT POSSIBLE TO GET A BLURRED PICTURE WITH A GOOD LENS?

This is usually caused either by misalignment of the entire optical system of the projector or by the lens not being securely held.

### MUST FAST LENSES BE ALIGNED MORE ACCURATELY THAN SLOWER ONES?

Yes. An extremely fast lens such as the Super-Snaplite, must be held securely at all times. The lamp, projector and lens must be kept in alignment. Check by interchanging lenses between projectors.

### HOW OFTEN SHOULD FOCUS BE CHECKED?

For perfect projection the focus should be checked at frequent intervals, especially after reels are changed. If, after checking focus, alignment and lens holder, the lenses do not give a good picture, they should be returned for inspection.

### HOW SHOULD COATED LENSES BE CLEANED?

Instructions on the care of coated and uncoated lenses are shown on the inside cover of the new display lens box in which all Series II and Super-Snaplites are shipped. Additional copies may be obtained by writing us. Ask for Form 66.

### SHOULD LENSES BE REPLACED IN LENS HOLDERS IN THE SAME POSITION EVERY TIME?

This is not necessary since all Snaplite lenses are so perfectly centered that no alignment marks are necessary.



"You Get the Most Uniform Light with Super-Snaplite"

**KOLLMORGEN**

2 Franklin Avenue  
Brooklyn 11, New York

*Optical*



**CORPORATION**

livery of final prints within five months, on the average, from date of photography.

During 1948 a record 38 features were shot in Technicolor, plus 9 in Britain. At present 42 features are being produced, in addition to 13 in Britain.

### Millionth Tv Tube Off RCA Line

Indicating that the time when Tv and the theatre box-office will meet head-on for the attention of the entertainment-seeker is not too far in the future is the announcement by RCA that the millionth Tv picture tube came off the production line last month (June). Figures for other tube manufacturers have not been announced.

### Nationalized Movies — French Style

In France the film trade is semi-nationalized. With the craze for precise classification that afflicts government bodies, an official schedule has now been prepared which sets out at some length the various types of damage which a film may suffer, reports the *Ideal Kinema*. They are included under two headings: defects affecting the surface and defects of the perforations.

The former are divided into rubbing, scratching and melting: a fine scratch is defined as measuring several tenths of a mm, while a wide scratch may be constituted by a number of fine scratches. The scratch may be shallow or deep, the latter when the gelatine has been completely removed.

The scratch may be continuous or intermittent; it may occur in the margin of the picture, at the sides of the picture, in the centre of the picture, in the margins of the sound track or in the track. Melting of the gelatine may be caused either by drops of water or of heated oil. Perforations may be rubbed by the projector shoes, picked, embossed, torn lengthwise, or across.

Evidently, if a projectionist wishes to report film damage he is expected to examine the film through a microscope and to specify precisely the damage category.

### More About High Tv Voltages

It is a habit of the human being gradually to become contemptuous of anything with which he becomes familiar. . . .

It is said time and again that the high-voltage units in Tv receivers will not kill because the current is too low; but we have heard of numerous instances when the physical damage was the result of involuntary motion in consequence of the shock. To put it simply, men have been injured because they jumped when shocked, and during that moment of involuntary activity their motions were completely out of control.

Safety interlocks are put on Tv receivers for a definite purpose to safeguard life and limb. The time saved by "shorting" the interlock during service inspection or probing of the receiver is too little to warrant the gamble involved.

Rubber gloves of the kind which will withstand high voltages should be a must in Tv work. Sleeves should be rolled down, thus covering the skin of the forearm. Operating in this fashion is not too clumsy. If a surgeon can operate with gloves on, the serviceman can handle tools with gloves on. —JOHN F. RIDER MANUALS.

### Exchanges Maintain Fine Safety Mark

A record of three successive years without suffering any loss from fire has been turned in by the 400 exchanges and shipping depots of member companies of the Motion Picture Association, it was reported by John B. McCullough, director of the organization's conservation department.

Over the last 23 years there were only 16 film fires in member-operated exchanges in the U. S., for an average annual fire loss of only \$211.04.

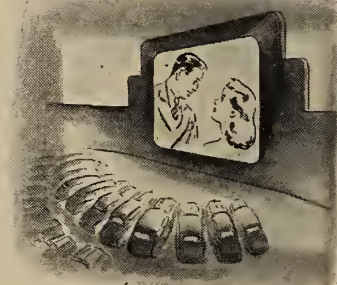
### Double-Feature Film Bill on Tv

Sponsors having deserted the Tv networks in droves for the summer season, WJZ-TV in New York will offer a two-hour, double-feature film "bargain" program each Tuesday night. Evidently the double-feature idea has caught up with Tv rather early. Film to be used was produced in the 1940-45 period, which is considerably later than some of the reissues and other junk now being spilled on theatre screens—with no advance warning.

## Giant "Drive-In" Images with Edge-to-Edge Sharpness



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## NEWTON'S RINGS

(Continued from page 19)

from A nearly normal to the film is refracted at point B, where it leaves the glass on entering the air film to point C where it is reflected back through the film to point D, where it is refracted along the same path as that portion of a ray coming from A1 is reflected at point D.

If the length of the path BCD is such that the light waves in the light following the path BCD are out of step one-half wavelength, they will interfere with or nullify those reflected at point D, and no light would be reflected from the film.

When the length of the path BCD is such that the refracted and reflected portions are in step, they augment each other and increased reflection occurs.

It would seem that the center area, where the glass surfaces are practically in contact, should appear bright because here the film thickness is very small compared with the wavelength, and sufficient lag to cause interference would not occur. The apparent discrepancy is explained as follows:

Reflection at C occurs in air and there is a lag in the reflected light of one-half wavelength. Reflection at D occurs in

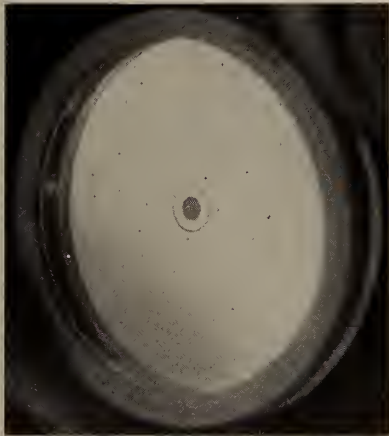


FIGURE 2

Newton's Rings in undeformed surfaces.

glass with no retardation. Accordingly, no light is reflected at the center nor when BCD is equal to any whole number of wavelengths.

Taking into account the change of phase or reflection mentioned, film thicknesses corresponding to odd multiples of one-quarter wavelengths will give increased reflection or "bright rings," and those corresponding to even multiples will give decreased reflection or "dark rings."

Heretofore we have considered the conditions for light of only one wavelength. When white light is used, the colors seen are those remaining after interference. It is interesting that light interferences as shown in Newton's

Rings also forms the basis of surface treatment of lenses to prevent a loss of light by reflection.

From the foregoing it can be seen that in the thickness of an air film the skilled optical worker has a means of extreme delicacy and accuracy for proving his work. It is surpassed by no other precise physical determination. It provides its own unchanging standard.

When he checks his work by simply noting the shape, color, and number of rings or bands that appear when he places the work in hand in contact with the master gauge, he can determine differences in curve or flatness in any de-

sired fraction of the wavelength of the light employed. By using this test he can arrive at such perfection of surface that molecular cohesion results when two such surfaces are brought together.

## New GoldE Reflex Slide Projector

Projectionists engaged in educational and industrial showings will be interested in the new GoldE Reflex 300-watt, blower-cooled projector, which is the only  $2\frac{1}{4} \times 2\frac{1}{4}$  slide unit to be built right into the case. The reflex, which has been proved ideal for color work, incorporates a number of patented exclusive features, one of which is the noiseless, powerful blower cooling system which keeps the entire outfit cool to the touch and

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### Distributors for Per-Fold Screen

Two supply houses have arranged to handle the new Radiant Per-Fold theatre projection screen. Wil-Kin Theatre Supply—of Atlanta, Ga., and Charlotte, N. C.—will cover Georgia, the Carolinas, and parts of Florida, Alabama and Tennessee. Falls City Theatre Equip. Co., Louisville, Ky., will serve Kentucky and Southern Indiana.

The Per-Fold screen is a perforated vinyl fabric which is said to be washable, flame-

and fungus-proof, and stain-resistant. When shipped it is not rolled but is folded into a compact package. Further details from Jack Tisch, Radiant Mfg. Corp., 2627 W. Roosevelt Road, Chicago 8.

### J. H. Kurlander, Lighting Expert

John H. Kurlander, head of the projection, photography, and miniature lamp section of the Westinghouse Lamp Division, Bloomfield, N. J., died of a heart attack in his Nutley, N. J., home on June 24. Mr. Kurlander was best known to projectionists as chief engineer of Brenkert Light Projection Co. in the 1920's and as secretary of the SMPE during 1930-37.

While at Westinghouse, which he joined in 1929, Mr. Kurlander made many important contributions to the lighting field: a gunshot lamp which eliminated the "blind spot" encountered in firing at enemy planes diving out of the sun; a device that produces either a spot of light or a flood of light from an ordinary hand flashlight; a blue bulb photoflash lamp emitting invisible, unobtrusive light; "black light" illumination for airplane instrument dials; and colored filter glass for automotive turn signals, preventing "ghost" signals caused by reflections of sunlight.

Kurlander was credited by the projection craft with the ability to make the Brenkert effect machine "talk" because of the ease with which he obtained a multiplicity of involved lighting effects in rapid-fire order.

### MONTHLY CHAT

#### Cooling Projection Equipment

(Continued from page 3)

house parts, particularly for the carbon jaws, and that it bears absolutely no relation to either the preservation of the film nor to the character of the projected image—a fact which is recognized and freely admitted by the majority of lamp manufacturers.

An increase in projected screen light as a result of carbon jaw water-cooling has never been proved in any laboratory or anywhere else. Quite the contrary is true, as is indicated by the following excerpt from the article by Messrs. M. T.

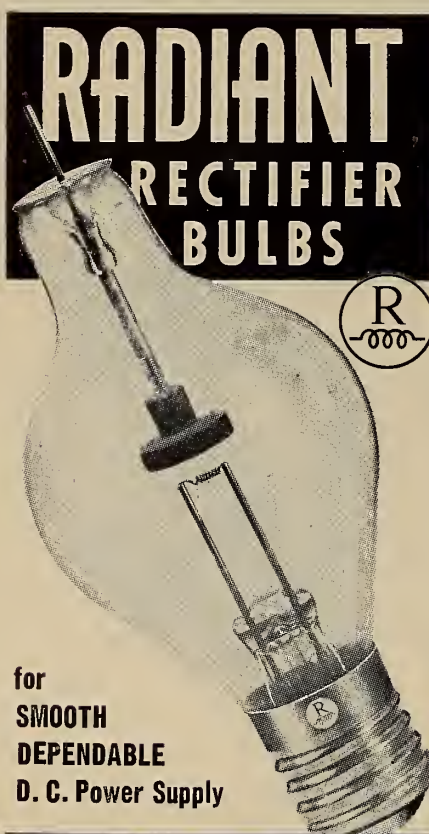
Jones and F. T. Bowditch, of National Carbon Co., on page 12 of this issue:

"The outstanding feature of the water-cooling, combined with the shorter carbon protrusion which this makes possible, is the ability to carry much higher currents than with air cooling, and to attain higher brightness as a result. Within the limits of satisfactory air-cooled operation, however, the carbon reaches a higher brightness at a given current than when water-cooled, so that the current efficiency of the carbon is reduced by water-cooling."

Statements out of context are often misleading; but from the same article is another excerpt which, in addition to a similar flat statement in the foreword, conveys the authors' opinion anent water-cooling, as follows:

"The ability to carry higher currents with water-cooling is not characteristic of all carbons, however. [Witness] the performance of the 13.6-mm super high-intensity projector carbon, representative of the usual type of carbon (see Fig. 5 in article). Here water-cooling in no case produces a higher brightness than can be obtained with air-cooling, and the current efficiency is always less" [italics ours.—Ed.]. "Thus with this, as with most conventional types of carbons, water-cooling has no such advantage in increasing brightness as is exhibited by the 'high-brightness' carbon of Fig. 4."

The effect of cooling the carbon jaw is to pull some heat (energy) out of the positive crater, thus permitting increased

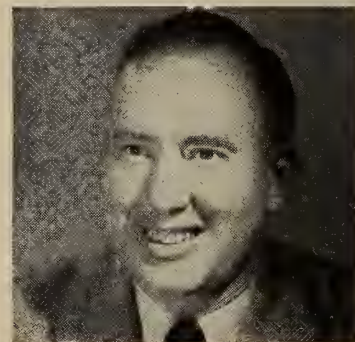


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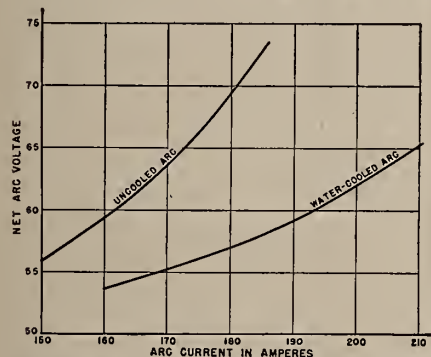
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current and therefore greater agitation of the electron particles in the crater. Granting that the design of the jaw-cooling unit is satisfactory (and not all of them are), the use of this equipment is a boon to the harassed lamp manufacturer who is constantly devilled by the increasingly severe requisites of high-intensity arcs and the probable resultant damage to lamp elements.

But doesn't increased current density and greater electron agitation in the positive crater result in increased light output and therefore a brighter screen image? Could be—depending upon two factors which are hardly ever mentioned.

As stated in the foregoing quotes from the Jones-Bowditch article, water-cooling the jaws is not effective in terms of efficient light output with *conventional types* of carbons. This method would be efficient only with carbons *specifically designed* for water-cooling. Such carbons are not now available generally, being in the experimental state.

Another factor in this situation which is almost never mentioned is the optical set-up employed in a given lamp. There is absolutely no point in pouring on the



Showing how water-cooling of the positive carbon causes a considerable reduction of crater brightness at the same arc length and current.

amperage and producing additional light for transmission through an optical system that was never intended to function under such conditions.

Water-cooling the carbon jaw will be advantageous in terms of improved screen image when the arc, using carbons designed specifically for the purpose, and the optical system are in precise balance. Meanwhile, this method serves only to protect the lamp elements.

**AIR-COOLED APERTURE.** The use of blowers to cool the aperture, and the film, is by no means new, having been employed irregularly for many years. This method received its greatest impetus about 20 years ago when the Grandeur and the Spoor wide-film systems enjoyed a brief vogue. Of course, these blowers served another purpose than cooling with these equipments, aiding in maintaining the film on a flat focal plane.

There can be no question of the effi-

ciency of these blower units in reducing the heat on the film (again granting a satisfactory design of the unit), as was amply demonstrated by F. J. Kolb, of Eastman Kodak Co., in the paper<sup>1</sup> he presented recently before the SMPE.

The Kolb paper describes a unit having a double nozzle through which air is directed at *both* sides of the film: the air directed to the emulsion side, where the silver is deposited, accomplishes the actual cooling job, while the airflow to the opposite side is intended to aid in keeping the film in a flat plane. Obvi-

<sup>1</sup> "Air-Cooling Motion Picture Film for Higher Screen Illumination"; presented at the Spring, 1949 convention of the SMPE. See abstract in IP for April, 1949, p. 17.

ously, the design of the air nozzles and the strength of the air current are vital considerations in this system.

The conclusion reached in the Kolb paper (and nobody gainsaid the statement) was that this method enabled a "substantial increase in screen illumination . . . such increase being from 30 to 60% beyond the present safe maximum." Here is a cooling method which, designed to protect *only* the film, has received widespread acceptance among technicians.

**WATER-COOLED APERTURE.** This technique has been employed intermittently for many years, particularly in Europe where arcs pulling even a comparatively

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moderate 75-85 amperes have consistently employed such units. There can be no question as to the efficacy of this system in terms of doing the job for which it is intended—that is, the preservation of the film, without any relation to the lamp mechanism.

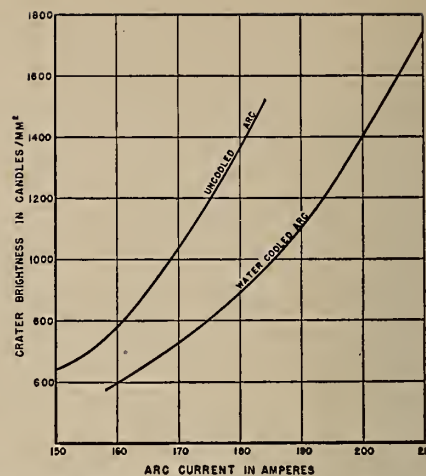
The foregoing will convey an idea of the complexities of the problem posed by the intense heat of the arc. The manufacturers of film, arc lamps, projectors and, yes, even optics are deeply concerned about this problem, which challenges the ingenuity of all of them.

This leaves the carbon people right in the well-known middle, because in their highly successful efforts to satisfy the insatiable demand for more and ever more light they have created a Frankensteinian situation which promises to devil them interminably. Meanwhile they are hardly in a position to dictate procedure to the manufacturers of the other elements of projection equipment.

### Single Unit Ineffectual

IP has not attempted in the foregoing summary to fry any prize fish, since it realizes that any specific recommendation must be predicated upon circumstances prevailing in a given installation. However, it must be apparent even to he who reads as he runs that this many-sided problem is not to be solved by attributing to a given unit or system cure-all attributes which won't stand up even on the basis of superficial consideration.

It is incredible to IP that, considering the gravity of this situation, there should be such a woeful lack of cooperation and coordination among those whose function



Comparison of crater brightness of cooled and uncooled arcs at equal currents.

it is to attack and solve such problems. Understandably, for example, the projector manufacturers' approach to the problem would focus first on the projector, and the manufacturers of film and arc lamps likewise. But just as surely as a single unit fails to meet the requisites of this situation, just so surely will the effort of an individual manufacturer fail to satisfy the broad requirements of the problem overall.

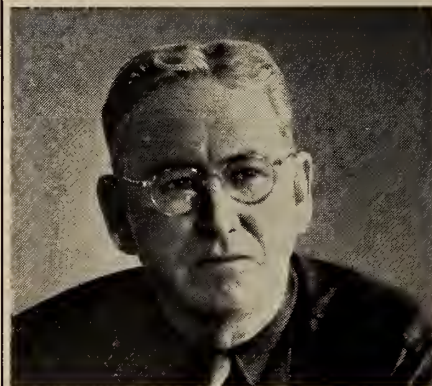
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for consideration of just what need be done, and how best to do it, to be followed by the issuance of specific recommendations applicable to a variety of projection set-ups. That agency is the SMPE, which surely qualifies for the job as a party interested only in coming up with the right answer. This neat little job of coordinating the thoughts and actions among a group striving for the answer to a problem of such gravity to the exhibition field would go far to dispel the notion, widely circulated of late, that the SMPE has been a bit disinterested in the practical aspects of film reproduction.

But whatever is done, speed is of the essence. It would be a pity if this situation were to endure to the point where the remark recently by an eminent lighting technician would reflect the truth. He said:

"This situation is one wherein gadget manufacturers and other irresponsible parties are trying to capitalize on the imagination of projectionists and exhibitors who are frantically seeking more screen light and are prepared, figuratively speaking, to grasp at a straw to obtain it."

## BRITISH vs. AMERICAN PROJECTOR DESIGN

(Continued from page 10)

a century. Why the projectionist using such equipment should be either a super-serviceman or a brainless coot is quite beyond my comprehension. I should have thought any projectionist would have been capable of putting over a better show with such machines.

The views on the SUPA are perhaps a matter of opinion; but the statements concerning the G-K 21 are without question factually wrong. The buyer is not tied to one supplier, because a feature of the design, I am advised, is that every individual component—stand, mute head, soundhead, arc, etc., is made to interchange with equipment of other makes.

### Adaptable to Every Circumstance

To be precise, the stand is designed to take any regular type of soundhead. The arc lamps are designed to internationally-accepted optical centres, and the lamp supports will accommodate any type of arc lamp. The optical centre of the projector head is to international standards and, therefore, interchangeable, while the drive to the projector is easily adaptable to the drive originated by Simplex.

Thus, G-K sound equipment can be used with any type of projector and any type of arc lamp. Alternatively, G-K projectors and arc lamps can be fitted to any type of sound system . . .

Dozens of equipments throughout the

country are using Magnarc and Ross arcs with G-K projectors on Western Electric Universal base. In other cases, G-K soundheads are used with Simplex projectors and Ross arcs. Similarly, G-K sound equipment is used with Ernmann projectors.

### IP's Editor Has His Say

Before one may comment intelligently upon the foregoing, it seems in order to have a definition of terms. Mr. Cricks' use of the phrase "years ahead of American design" would seem to imply that such advances (?) in design in themselves inevitably produce a screen image

better than that possible with American projectors.

Mr. Cricks took the first aggressive step by making the *positive* statement that the new British designs enabled a superior screen image; IP merely remarked, in passing, that this was cover-

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ing quite a chunk of territory. One would naturally assume that a new design would produce an improved screen image; but such an assumption, in the

eloquently precise lyrics of *Porgy and Bess*, ain't necessarily so.

The function of a projection apparatus is to give the best possible screen image

—which, freely translated, means the most light over the greatest area with the best definition and the maximum degree of image steadiness. The mere fact the latest British projector designs are pleasing to the eye does not mean that they discharge the aforementioned functions with any more efficiency than do the American projectors now available.

True, British mechanisms are "inter-changeable" with various other units, but this in itself adds not one lumen nor more definition nor more steadiness to the screen image: this has long been the goal of projector manufacturers the world over—British, Dutch, German, or American.

### **Curved Gates, Independent Drives**

Curved gates are "old hat" in American projector design: we did this when we essayed the ill-fated 65-mm wide-film experiment in the '30's; independent drives are also nothing new to American technique, as was so magnificently demonstrated by the RCA-Walt Disney apparatus for the roadshowing of *Fantasia*, which setup employed Selsyn interlocks which would put to shame the so-called "independent" drives for picture and sound which now are clarified by British manufacturers as the last word in projection technique.

The true, the only significant test of any projection mechanism is the quality of the screen image. On this score we are willing to wager that any of four existing American mechanisms will at least match, if not actually exceed, in *quality* of screen image the production of these "new" British designs. In this statement we are not motivated by any "patriotic impulse": we're willing to let the screen image reflect its own quality.

### **Too Easy Transition Effected**

We regard Mr. Cricks as one of the best informed and most able commentators on cinematography in the world (including the U.S.A.) and we have enjoyed his writings for many years. But we are forced of necessity to take a different lane when, quite apart from his off-the-cuff allusion to our "patriotic" motives in assaying projectors, he blithely endows a "new" design with end results superior to those American projectors which have for years performed in such fashion as to set the standard for the world.

Moreover, we have again checked with our Canadian friends who have been operating the G-K 21 projector, and their advice conforms to their original reports on this mechanism: far from having licked the "teething" trouble indigenous to most new equipments, the G-K 21's still require that degree of close attention and periodic servicing that was unknown when American projectors were used.

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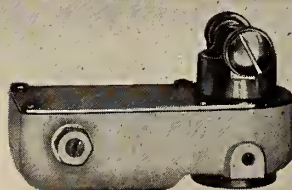
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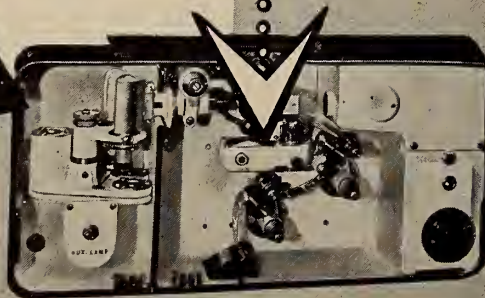
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## DISTORTION FACTORS IN SOUND REPRODUCTION

(Continued from page 6)

soundheads (accompanied by reduction of volume and, with variable-area tracks, non-linear distortion); warping circuit or tone control not properly adjusted; failure of high-frequency speakers, and impedance of one of the many amplifier circuits incorrect (due perhaps to a short-circuit or to leaving the non-sync pickup connected to the input circuit).

3. **Loss of Lows.** (This is also a special case of frequency distortion.) **SYMPTOMS:** Music thin and tinny; ordinary noises crackly and hissy; voices clear, but all sound nearly alike and rather shrill.

**Causes:** Failure of low-frequency speakers, warping circuit or tone control not properly adjusted, and open-circuited or leaky condenser in a low-pass circuit.

4. **NON-LINEAR DISTORTION.** SYMP-

**toms:** Sound which is unnaturally harsh, shrill, raspy, or blurred. A non-linear distortion factor under 5% cannot be detected by the human ear.

**Causes:** As this type of distortion may be present in the film or disc records, a hasty diagnosis should not be made. When the non-synchronous gramophone produces a non-linear output, look for a worn needle or a worn or defective record.

### Common Distortion Factors

We instinctively check the tubes of the amplifier when non-linear distortion appears, for defective tubes are the most common cause. Other causes include a too low ionizing potential for the photo-electric cells, too low filament currents or plate voltages for the amplifier tubes, insufficient magnetizing current for the speaker fields, and out-of-focus sound-head optics. (The latter also cuts off high frequencies.) The trouble-shooter will therefore check the various voltages and currents mentioned to get at the root of the trouble.

**REMARKS:** An accurate determination of non-linear distortion produced in the sound system can be made only by observing the distortion produced in the sine-wave curve on the cathode-ray tube of an oscilloscope when test films or discs of pure tones are played.

Speaker rattles may also be classed under non-linear distortion, even though the cause is purely mechanical and more or less frequency-selective. Rattles and raspy noises are most likely to occur during loud sounds and, if frequency distortion is present, only at certain frequencies of sound as a rule. Speakers (including the monitors in the projection room) should be checked for rattles every few months. Naturally, the condition of the cones or diaphragms will be noted during such checkups.

5. **TRAVEL DISTORTION.** An uneven motion of the film through the sound-head scanning beam (or of the gramophone record under the pickup needle) results in several peculiar types of dis-

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tortion, each of which has been given a descriptive appellation.

**SYMPTOMS:** Wows, flutter, gargle, and whiskers. If the variations are either irregular or of any frequency up to 5 c.p.s., the effect is known as "wows"; if of some frequency between 5 and 30 c.p.s., it is called flutter; between 30 and 200 c.p.s., "gargle"; and if over 200 c.p.s., it is known as "whiskers." "Gargle" cannot be heard in the bass tones, and "whiskers" are heard only as a raspy quality imparted to the high notes: for this reason "whiskers" may be wrongly interpreted by the untrained listener as non-linear distortion.

**Causes:** Wows may be caused by grime-caked grease in rotary stabilizer bearing races, or by insufficient pressure—roller tension on the scanning drum. Wows and flutter are often caused by insufficient gate tension in the old-style soundheads—often well-nigh incurable in those antiquated models having an "impedance roller" interposed between sound sprocket and gate. "Gargle" and "whiskers" are caused by insufficient gate tension and worn sound-sprocket teeth in old-fashioned soundheads; also by a fluttering piece of lint accidentally lodged in the sound gate.

Note that all forms of travel distortion may be produced by bent or sprung sound-sprocket shafts in certain obsolete soundheads!

#### Extraneous Noise Sources

6. **EXTRANEOUS NOISES.** These are classified as types of distortion, although actually they are not. Extraneous noises result from the superimposition of unwanted externally-generated signals upon the recorded signal. When the film is at fault through scratches—an excessively large number of splices, coarse silver grains, etc.—little can be done about it. Cutting off the higher frequencies of sound by means of a variable tone control eliminates some of the hissing surface noise, but it also spoils the "brilliance" of the recording.

Offending splices may be blooped over with Movietone ink; but the bloops, in order to be effective, must be at least one inch in length and very smoothly graduated. Inexpertly-made bloops create more noise than do bare splices.

Frame-line noise and sprocket-hole "motor-boating," if not due to misalignment in printing, indicate that adjustment of the soundhead lateral film guide is needed.

Power-line hum (120 d.v. if 60-cycle current, 100 d.v. if 50-cycle) may find its way into the sound system because of a burned-out rectifier tube, a defective power-amplifier tube, inductive pickup by amplifier circuits from an unshielded power-supplying transformer, inductive or capacitative pickup by photocell leads or speaker cables, short-circuited filter

chokes or open-circuited filter condensers, or light from the projection room falling upon the photocells. Hum from nearby high-voltage neon signs is easily picked up.

A strong clattering 96 d.v. "hum" sometimes accompanied by a faint 60- or 120-cycle hum or a high-pitched squeal, is caused by light from the projection head leaking into the photocell—usually by reflection from some object like the glass in the projector port.

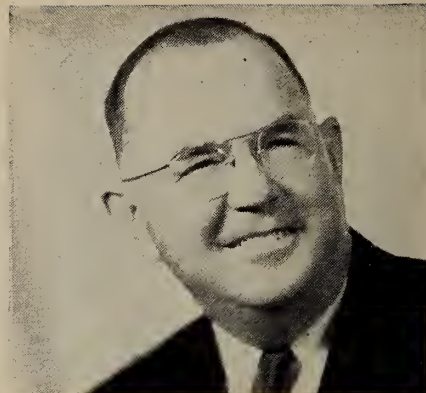
Recurring clicks are caused by film splices, by film marred by "sprocketing," by marquee flashers, and by sundry electrical devices in the theatre or surrounding buildings. Electrical shielding of the disturbing device is indicated.

#### The 'Small-Shot' Effect

A curious type of clicking noise warrants special mention because it has occasioned much needless worry. The crackles sometimes heard when a sound system is warming up are usually due, not to loose connections or something on the verge of burning out, but to the *Schroteffekt* (German for "small-shot effect"). This phenomenon, common to nearly all types of amplifier and radio tubes, has been explained on the basis of statistical variations in the number of electrons per second emitted by the tube cathode.

One need not become alarmed by such sputtering and popping noises. They cannot be helped and they do no harm.

Squeals and whistles in the sound are usually due to *microphonic* tubes. Such tubes, while they may be otherwise good,



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have elements which were loosened in manufacture or by rough handling. The loose elements within the tube begin to vibrate and the vibrations, by varying the distance between the elements, cause the plate current to be affected proportionately. The slight variations in the current are amplified to a singing howl. But squeals and howls may also be caused by wornout tubes with low electronic emission. All tubes should be checked periodically.

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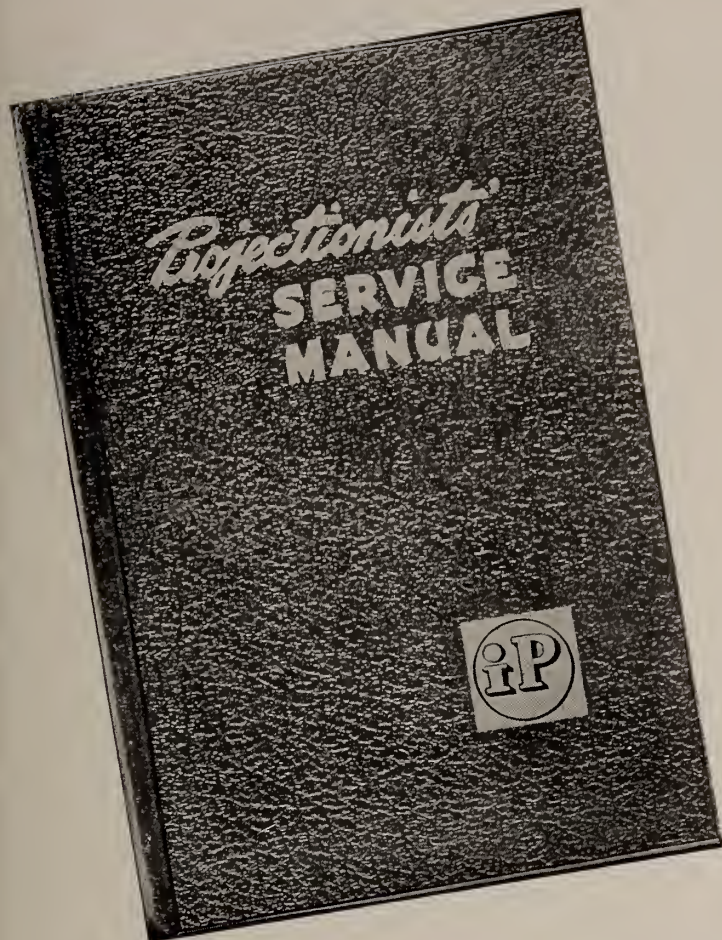
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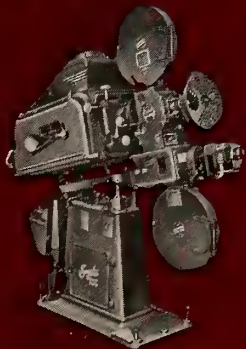


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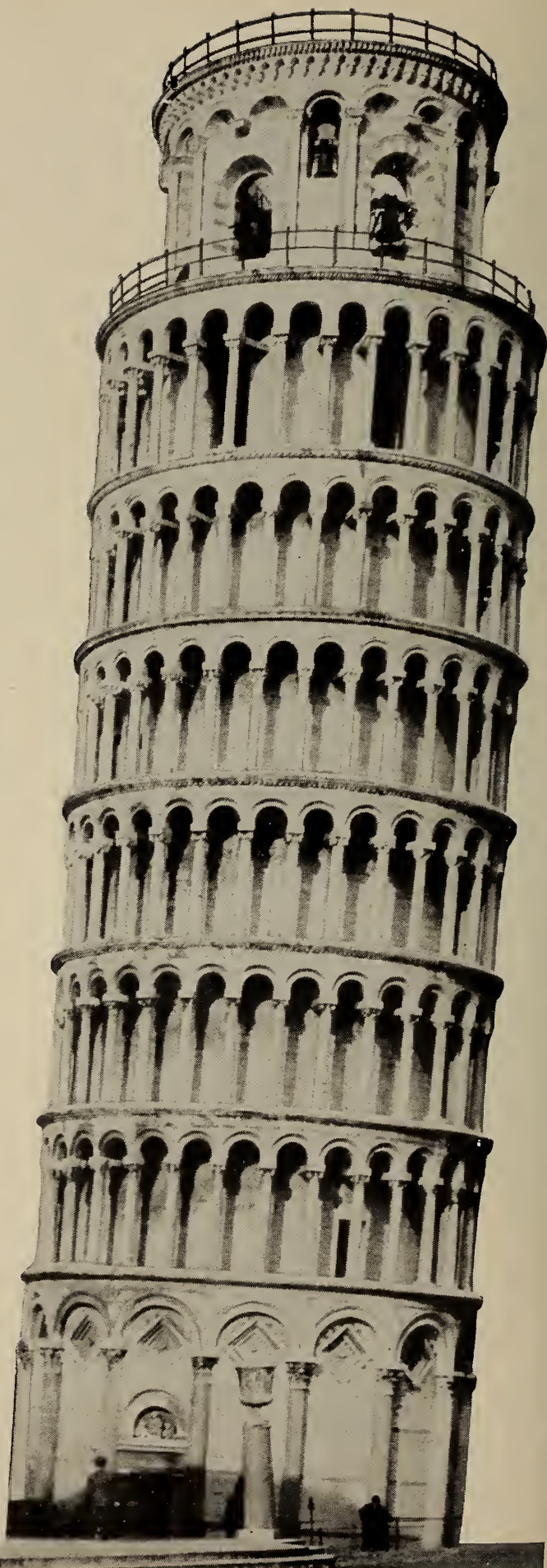
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With Which Is Combined PROJECTION ENGINEERING



HENRY B. SELLWOOD, *Editor*

Volume 24

AUGUST 1949

Number 8

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## MONTHLY CHAT

THERE are many items of a non-technical nature, properly classified perhaps under the heading of "good and welfare," which should be reported and discussed in the columns of a craft paper such as IP predominantly is. For the true craft paper should concern itself not only with the technical savvy of its readers but also with their economic well-being, *i. e.*, their security, which in turn is dependent upon the economic health of the industry in which they work. Particularly is this true of the motion picture industry, the nerve centers of which are almost continually jarred by the mental gyrations of those executives who guide its course.

Pointing up the growing appreciation of continuing industrial economic health among workers in every business is the current tendency by Labor to forgo the immediate benefits of wage increases in favor of the long-term advantage of payments for health, retirement and death—security with a capital S. This tendency is not pronounced at present in the entertainment field, but now that the first step has been taken by Chicago Local 110 in its memorable contract settlement of 1948, we may expect to see many travelers along this road.

We think it important that projectionists know, for example, the economic effects upon their industry, their jobs of the decrease in income from the sale of American films abroad; of the increase or decrease in the number of pictures now rolling in Hollywood studios and scheduled for the balance of this season; of the government-enforced breakup of the theatre chains now controlled by producers and distributors; of the trend of theatre admission prices nationally; of the total box-office take as related to last year and the year before; of labor contract settlements, advantageous or otherwise—in short, of all those industry happenings which ultimately must filter down and affect the security of both Joe Doakes in a Broadway theatre and of Joe Miller in a subsequent-run in Walla Walla.

Just because projection work by its very nature is so very confining is no reason why its practitioners must operate in an informational vacuum, especially where the net result of all their labor, their security, is concerned. Technical data is a "must" for projectionists, of course, and IP is justly proud of the fine record it has compiled in disseminating such information. But IP proposes doing something about disseminating in one special corner of each edition that information which affects the basic needs and aspirations of its readers—their security.

The next issue of IP, then, will mark the inaugural bow of a section which will provide projectionists with a better understanding of the industry to which they look for their security.

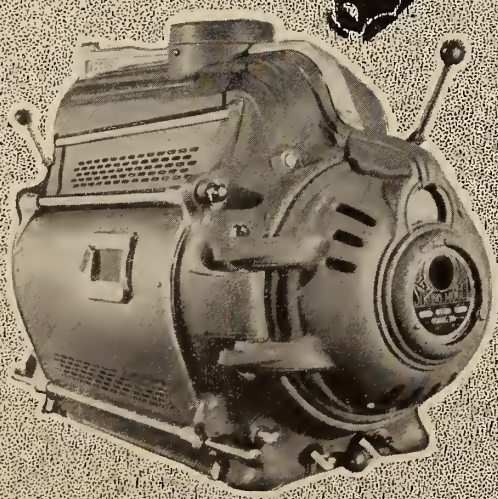
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## Lens and Film Factors Affecting Focus

**C**OMMERCIAL television has done more than anything else to direct attention to *definition* in picture images, both televised and projected. Video image quality is constantly compared with that of the movies, and it is obvious to all that Tv falls far short of the 35-mm motion picture in clearness, pictorial scope, and ease of viewing—a fact even more irritating than the lack of natural color to those who had expected to find in Tv an acceptable substitute for the dramatically mighty screen of the motion picture theatre.

The theatre projectionist has a large share of the responsibility of maintaining the supremacy of the standard motion picture over its competitors in the substandard (16-mm) and Tv fields. The maximum degree of clearness, brilliance, and vivid contrast in the screen image is the hallmark of first-class projection.

### Factors Affecting Definition

Ultimately, the definition of a projected motion picture is limited physically only by the size of the silver grains in the developed film emulsion and by the resolving power of the projection lens. The film and the lens, therefore, receive the lion's share of attention when improvements in image definition are demanded.

It should not be supposed, however, that these are the only factors affecting the clearness and contrast of the picture. The performance of the projection arc lamp is an extremely important factor. So, too, are the screen surface, the glass

By ROBERT A. MITCHELL

in the projector ports, the projector mechanism, and even the general auditorium illumination conditions.

The projection lens has been characterized as the neck of the bottle through which the concerted efforts of the industry must pass. If the lens is injured, soiled, or otherwise defective, it will impair image definition by (a) failing to bring the image to a sharp focus in one or more areas of the screen, (b) focusing sharply, but producing a luminous mist over all bright objects in the picture, or (c) reducing overall contrast in such a way that the darker tones of the picture "wash out" to give dirty and chalky grays.

Any lens which is unable to form a sharp, clear-cut image over the entire screen surface is absolutely unfit for use. The original price of a lens and the prestige of its maker are as nothing in the face of actual performance. Many of the older lenses (including a few expensive, imported ones) produce a blurred image of the edges of the picture when the center is sharply focused. Any attempt to sharpen the edges will blur the middle.

Modern lenses of good quality are designed to provide a uniform and flat field, and are remarkably free from spherical and astigmatic defects.

Blurred picture edges are often produced by the camera lens and photographed on the film, a circumstance in which the projectionist is helpless. But

an out-of-focus edge or corner of the picture is also caused by a worn condition of the projector film gate, about which the projectionist can do plenty.

### Effect of Lens Injuries

Scratches on any of the delicate and highly polished glass surfaces of the lens "elements" impair image definition by scattering light from the brighter to the darker portions of the picture. The result is a lowered contrast somewhat like that caused by extraneous light "fogging" the screen.

One or two deep scratches on a lens look very alarming indeed, but they are not as detrimental to picture quality as a multitude of very fine scratches all over a lens surface. Now, small scratches are the inevitable result of injudicious cleaning methods—vigorous scrubbing and scouring, and the use of lens powders, pastes, carbon tetrachloride, alcohol, and soiled cleaning cloths.

At first the scratches are so small as to be actually invisible to the unaided eye, but they are there, and their number increases every time the lens is subjected to abusive cleaning. In the course of a few years the "invisible" scratches are so numerous that the lens appears etched or frosted; and the picture, instead of having "snap," is dulled by a veil of dispersion fog.

All that is needed in the way of lens-cleaning materials are a small camels-hair brush, a quantity of 2-inch squares of clean, dust-free cotton cloth, a cleaning solution made by dissolving a piece of Ivory soap the size of a large pea in

a pint of pure (distilled) water, and a bottle of distilled water for rinsing off any scum which may remain after gentle cleansing with the soap solution.

The soap solution is to be used sparingly for removing oil, finger-marks, etc., from the lens *and only for this purpose*. It is not to be used for the more or less routine removal of dust from the lens. (Dust is gently brushed off with a camels-hair brush or, if particularly stubborn, with a square of dry cotton cloth.)

Laundry soaps and soap powders should never be used for making up the cleaning solution because they may contain trisodium orthophosphate, borax, or an excess of caustic soda—substances possessing the dangerous potentiality of chemical reaction with glass. The soapless detergents (hymolal salts) are themselves harmless to lenses, but most of the soap powders containing them are liberally adulterated with harsher agents.<sup>1</sup>

The individual elements of achromatic projection lenses are themselves composite. In most cases the components of a lens element are cemented together with a transparent plastic material in order to reduce surface reflections which diminish contrast and dull the image.

### Balsam as a Cementing Medium

The cementing material employed in practically all of the older lenses was Canada balsam, the refined resinous exudation of the fir tree. Canada balsam deteriorates with age, and the heat of the arc-lamp beam hastens decomposition and often causes it to blister. When the balsam is discolored and frilled, image definition suffers. The effect on the picture is even worse than that produced by a soiled lens.

The use of alcohol as a lens-cleaning fluid also causes the balsam to frill and separate from the glass, the blistering beginning at the edges of the lens and gradually working in toward the center. This bad practice is perpetuated by an equally bad projection textbook which disastrously recommends "a mixture of half clean water and half grain alcohol" for cleaning lenses. This, be assured, is a lethal cocktail for any lens. Carbon tetrachloride, chloroform, acetone, and ether may also cause irreparable damage.

Lenses disabled by blistered and discolored balsam should be returned to the manufacturer for servicing. The cementing of lenses should not be attempted in the projection room.

Modern American lenses of the best quality utilize special heat-resistant thermosetting resins, synthetic products which are vastly more durable than Canada balsam. But this does not mean

that they are unaffected by organic solvents!

The distance between the film and the lens which gives the sharpest focus on the screen is extremely critical. The slightest deviation from this definite "focal distance" reveals itself as a blurred picture, a condition to be rectified by adjusting the separation of lens and film to re-establish the correct focal distance. Theoretically, this adjustment could be made by moving *either* the lens or the film along the optical axis of the projector, but in practice *focusing* is accomplished by changing the position of the lens only, the film-plane obviously being fixed.

### Focus Variations Unavoidable

So self-evident is this elementary principle that many projectionists have been inclined to overlook the tremendously important fact that even though the distance of the tiny film-photograph from the fixed aperture is not manually adjustable, it is subject to short-range variations which produce corresponding variations in the focus.

Although we know that the film-photograph will lie *somewhere* within a close region facing the aperture plate, we can never tell *exactly* where it will be. And yet the correct focal distance must be maintained at all times in order to avoid out-of-focus screen images!

Considering the fact that film has an appreciable thickness (about 0.00575 of an inch) and that only a thin layer on one side of the film (the photographic image in the emulsion) is to be focused sharply, the other layers being necessarily slightly out of focus, we can estimate that the film-photograph at the aperture has an average range of possible in-and-out variation of position of approximately 0.005 of an inch. In extreme cases (warped and buckled film) this range may be exceeded.

The position which the film-photograph chooses to occupy inside this 0.005-inch region directly in front of the aperture depends solely on the type and condition of the film. It is beyond the control of the projectionist.

Now, the position of the film-photograph may remain sensibly constant throughout the entire length of a print, requiring but a single setting of the

lens, or it may undergo either random or progressive variations in the same reel, requiring constant attention to the maintenance of focus.

Spontaneous variations in film-photograph position result in image flutter and focus drift. Differences in *average* position are noted between different prints, and especially between black-and-white and color prints. In most cases the difference does not exceed 0.001 or 0.002 of an inch, but even this small departure from critical focal distance produces a noticeable loss of image definition.

The maximum deviation of about 0.005 of an inch occurs with frame-embossed, curled, and buckled film, and also with "reversed" films which have to be projected with the emulsion facing screenward instead of toward the lamp, as in the case of normal films printed from negatives.

Is it not obvious that projection quality will be poor if the projectionist fails to make occasional focus adjustments during the show?

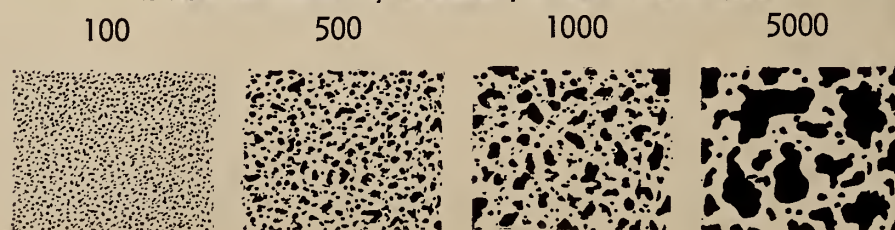
### Focus of Color Films

"Duplitzed" prints (Cinecolor, Mag-nacolor, Trucolor, etc.) pose a special problem for projectionists. These films carry two emulsions, one on each side of the film base. As the two emulsions are separated by about 0.00475 of an inch, it is impossible to bring both of them to a sharp focus at once; and the focus-difference is most pronounced when lenses of short E. F. are used. The problem is further complicated by the fact that the two superimposed photographic images have complementary colors (red-orange and blue in some processes; red and blue-green in others).

Shall the focus be compromised so that red-orange and blue images are equally out of focus; or shall one of these images be focused sharply, ignoring the other?

The writer's opinion is that the less luminous of the two colors be focused sharply. The color sensitivity of the human eye is such that blue appears less luminous, or "darker," than red, and hence provides most of the contrast of the colored picture. The blue image, therefore, is the one which should be brought to a perfect focus on the screen

Photomicrographs reveal the appearance of the silver grains in the film emulsion when magnified to the extent indicated by the number positioned over each square.



<sup>1</sup> See "Coated Lenses: Nature and Care" by A. E. Murray (IP for February, 1949, p. 7) for a complete exposition of approved lens-cleaning methods.



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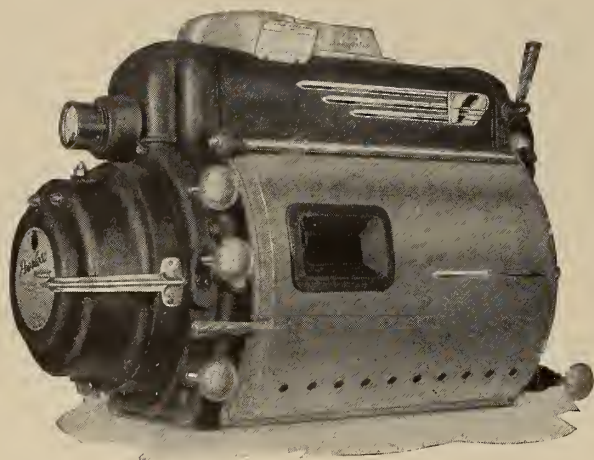
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It will be found upon examining a duplitzed color film that the blue image is oriented to come on the normal "emulsion side" of the film, therefore the focus difference between duplitzed and ordinary black-and-white prints is not as great as some people think.

Technicolor is a horse of a different color, figuratively speaking. The Technicolor printing process is unique, being more like ordinary printing than a photographic process. Three black-and-white positives, called "matrices," are chemically treated to make the picture images soak up colored dyes. The three dye images are transferred to the projection positive by simple contact. Exact register of the yellow, magenta, and cyan dye images on the projection positive is absolutely essential to the clarity of the colored picture on the film.

The Technicolor dyes affect the gelatin of the projection positive in such a way that the Technicolor image is a trifle closer to the film base than is an ordinary silver image. The result is that Technicolor requires a slightly different focus than do b-and-w subjects. Failure to heed this requirement places Technicolor under a severe and needless handicap. Properly projected, Technicolor prints provide beautiful and entirely satisfactory screen images.

The chemical constitution of the film base (nitrate, diacetate, triacetate, acetate-propionate, etc.) has no effect whatever on the definition of the projected picture. Irregularities in the thickness of the film base, however, may introduce focusing troubles. This is particularly true in the case of duplitzed color prints.

[To be Continued]

## Forty-One Years Ago

Open-Air Theatre in Jacksonville, Fla.

The opening of the Summer season at Dixieland Park proved a remarkable success. In the afternoon fully 1500 people visited the park and enjoyed the concert, but it was in the evening that the big crowd turned out to see the open-air moving pictures.

At least 2500 people were on the grounds before eight o'clock, and the seating capacity, which had been arranged for 2000, proved entirely inadequate. Manager Da Costa and several of the directors were present, and it was at once decided to arrange seats for at least 1000 more people.

The pictures started promptly at 7:30, and were very good. They could be seen nicely at a distance of 1000 feet from the elevated canvas, and were thoroughly enjoyed by the immense audience. The full 3000 feet of films were run and the entertainment lasted a little over an hour.

*Moving Picture World, May 16, 1908*

# Recent Film Technical Advances

## Excerpts from a Report by the SMPE Progress Committee

A MODERATE amount of new recording equipment was introduced last year and broad progress was made in the widespread use in this country and abroad of facilities announced in 1947. Supersonic-radio playback transmitters, with miniature receivers and earphones that can be hidden in the hair or clothing of an actor, were used in Hollywood. These systems proved useful and time-saving in playing back records or for cuing the actors without interfering with recording of dialog.

Some daily prints of picture and sound were made on new safety-base stock by Hollywood laboratories, but its use as negative stock was limited by availability. A large amount of engineering effort was devoted to magnetic coatings on 35-mm safety-base film.

### Magnetic Recording Upsurge

A 35-mm magnetic film recorder was introduced by RCA for either portable or studio use. Operating at 18 inches per second, it provides for wide-range recording and excellent film motion. Recording and playback heads are provided, and an erase head can be added if desired. The bias oscillator and playback preamplifier are mounted inside of the recorder.

A similar film recorder was introduced by W. E. which may be used for either the magnetic or optical method, thereby facilitating a transition period or re-recording operations in a small studio. High-quality re-recording and review-room machines were introduced on a field-trial basis. A 35-mm magnetic recording and reproducing unit was also demonstrated by Reeves Sound.

### System's Numerous Advantages

By the end of the year most of the studios in Hollywood were equipped with at least one 35-mm magnetic recording machine capable of operation in synchronism with a camera or projector. Some studios gained additional operating experience through the use of tape recorders in applications where synchronism was not essential.

Extensive laboratory tests and limited studio use have established that magnetic recording is of considerable importance for all types of work where re-recording is involved. Excellent frequency response up to 15,000 cycles has been obtained with an inherent ground-noise-to-signal ratio of 50 db or better. Ground noise does not appear to increase with film usage and the magnetic sound record is long-lived. Other advantages include film re-usage, immediate playback, elimination of lightfast require-

ments, and simple operation. Important economies can be realized by the reduction of film and processing costs.

Re-recording operations at Warner studios were simplified and reduced in cost by first combining up to 20 sound-effects tracks into a single reel of magnetic film. In the final re-recording operation two magnetic sound tracks were made simultaneously: one containing all the speech, music, and sound effects, and the other having only the combined music and sound effects. The latter track is then available for making 16-mm versions and for the use of the foreign department in combining the music and sound-effects track with a foreign-speech track.

### 16-mm Recording, Processing

There was unusual activity in the 16-mm field both in original recording and in re-recording from 35-mm or 16-mm films, which resulted in better sound quality than was obtained two or three years ago. The recording was done by using negative-positive methods and equipment previously announced or by the direct-positive method which eliminates the necessity of making a negative.

A direct-positive variable-density recording technique was introduced by W. E. in which a 24-kilocycle bias was applied to the light valve along with the audio signal to reduce distortion and improve the volume range.

The use of the so-called 35-32-mm process as a step in the release of 16-mm prints increased appreciably during the year. It employs special sound negative film 35 mm in width having 16-mm perforations along each edge.

Two re-recorded sound tracks are placed near the center of the film by recording at 36 feet per minute in opposite directions, and then processed in standard 35-mm developing machines of the sprocketless type. Printing is done from the double-track sound negative along with the picture to 32-mm release print stock, is developed by standard positive processing except for rollers 32 mm in width, and then is split.

### Visual Sound Reproduction

This general method has the advantage of standard 35-mm processing equipment and control as well as locating the sound track in the center of the film where it is protected from rollers and sprockets. At the present time seven Hollywood studios can do this type of recording and at least four laboratories the processing.

There was relatively little indoor theatre construction and only a minor

amount of modernization activity in the U.S.A. last year (1948). The installation of soundheads, amplifiers, and modern two-way loudspeaker equipment to replace outmoded and wornout equipment continued at a moderate pace. Some increase in modernization was noted toward the end of the year.

The outstanding 1948 development in the 35-mm field of theatres and equipment was the enormous increase in the number of drive-in installations, which at the end of the year were variously estimated to number somewhere between 800 and 1000.

Part of the popularity of the drive-in is due to the now almost universal use of individual in-car speakers, which eliminate the interference and sound-transit-time problems encountered in the first drive-ins using central-speaker equipment. Screen "presence" and "illusion" are generally satisfactory in spite of the displacement between picture and speakers.

### **High Amperage Poses Problems**

Drive-in theatre screens range up to 65 feet in width. To put a reasonably satisfactory picture on such screens, a trend developed toward the use of higher and higher powered light sources, faster lenses, and filters and blowers to cool the film at the projector aperture. The use of high-intensity arc lamps of the condenser type burning 150 to 170 amperes continued, and reflector-type lamps were improved and their operating current ranges were increased. Double-shutter projector mechanisms were widely used in drive-ins.

Sound-equipped designs remained more or less standard except for use of large Class B output amplifiers to deliver the considerable amounts of audio power required by the hundreds of individual speakers of relatively low efficiency in the average installation. Motion-graph brought out multiple-amplifier systems, with each amplifier serving only a small group of speakers for improved reliability and greater emergency protection, and also developed a system of lighting for the speaker-junction boxes to reduce collision risks.

Toward the end of 1948 two manufacturers brought out speaker-heater combinations to extend the season in temperate climates and promote comfort in those having 12-month seasons, but chilly nights. Heaters dissipate approximately 250 watts and have small blowers to distribute the heat and keep surface temperatures to more or less reasonable values.

### **Broaden Acetate Film Use**

During 1948 acetate safety-base 35-mm film for release prints came into limited use, principally for certain types of color films. The performance was generally

## **Accuracy of Unsteadiness Test Films**

MR. R. H. CRICKS, editor of *Ideal Kinema* (London) commented on the quality of unsteadiness test films. In general, his comment is correct as far as it goes. He paints, in part, a good picture, but he is not a finished artist because he has omitted a number of important brush strokes.

Mr. Cricks states: "American steadiness test films are . . . prints," and he opines that prints are generally unsatisfactory for testing for steadiness of projection.

A 35-mm steadiness test film produced by the SMPE is a negative-perforated safety positive film which has low shrinkage characteristics. The original negative is photographed in a camera known to have inherent unsteadiness of the order of normal tolerances of 35-mm negative perforations. Prints are made on a step-printer with closely-fitting negative registration pins.

### **Tolerance to Vanishing Point**

The measurable print unsteadiness in the vertical direction is somewhat less than one-fifth of 1% of the picture height, and the lateral unsteadiness is about the same proportion of picture width! These errors are substantially within the tolerances for most 35-mm projectors. This film might not satisfy the exacting requirements for studio process projectors, but it should and does serve more than adequately for theatre projectors.

Mr. Cricks mentions a special perforator which he has used which punched a hole in the center of the film at the same time that the perforations were made, the purported advantage being that "the test hole was necessarily registered with perfect accuracy with the feeding perforation."

A qualification would seem to be in order here, for it is obvious that any error

in the perforating of the film—that is, from one punch stroke to the next—would cause unsteadiness of the reference hole *if the same perforations were not used to register the film in the projector*. This holds true for 16-mm as well as for 35-mm film.

Bearing on this problem is the very fine unsteadiness film made by Bell & Howell Co. which is practically independent of perforation errors. This film is described in detail by M. G. Townley in the *SMPE Journal* for July, 1944. Unsteadiness of the single center reference hole alone is a true indication of projector unsteadiness *only* when the projector registers with the same perforation that was punched with the reference hole.

### **Double-Check on B. & H. Reel**

To make the film a valid test for unsteadiness in projectors which register with a different perforation, Mr. Townley has added a second reference hole on the frameline, punched at the same time as the preceding sprocket hole. He then uses one mirror to project an image of the center reference hole and another mirror to project an image of the reference hole punched in the center of the frameline by the preceding stroke of the perforator.

Movement between these two reflected images is a true index of perforation errors, and movement of the pair of holes is a true indication of projector unsteadiness. Mr. Townley utilizes round holes, just as Mr. Cricks did, and measures unsteadiness with a ruler.

The SMPE has a photographed pattern that permits unsteadiness to be gauged directly in percent of both picture height and width. This would appear to be a simpler method. Perhaps somebody will some day apply the same system to a 16-mm unsteadiness test film.

satisfactory, though considerable difficulties with splices were observed, possibly because projectionists do not always recognize the safety-base film and hence do not use the special splicing techniques it requires.

No relaxation in projection-room safety requirements was reported, which is to be expected so long as any nitrate film is in common use.

Release prints generally were of excellent quality with respect to both sound and picture during the year, with the exception of some of those made for reissued pictures. Sound on these was substandard in quality, and cases were reported where the original negatives

were apparently so badly shrunk that picture frames failed to fill projector apertures completely, causing light streaks at the picture borders.

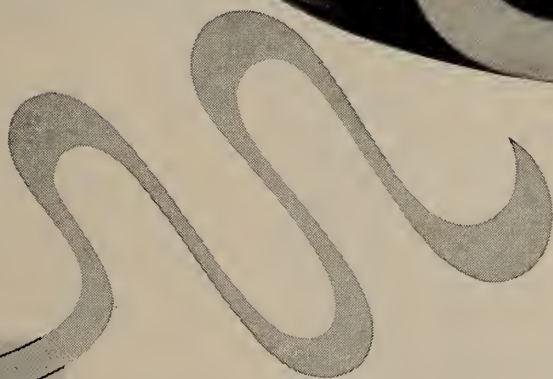
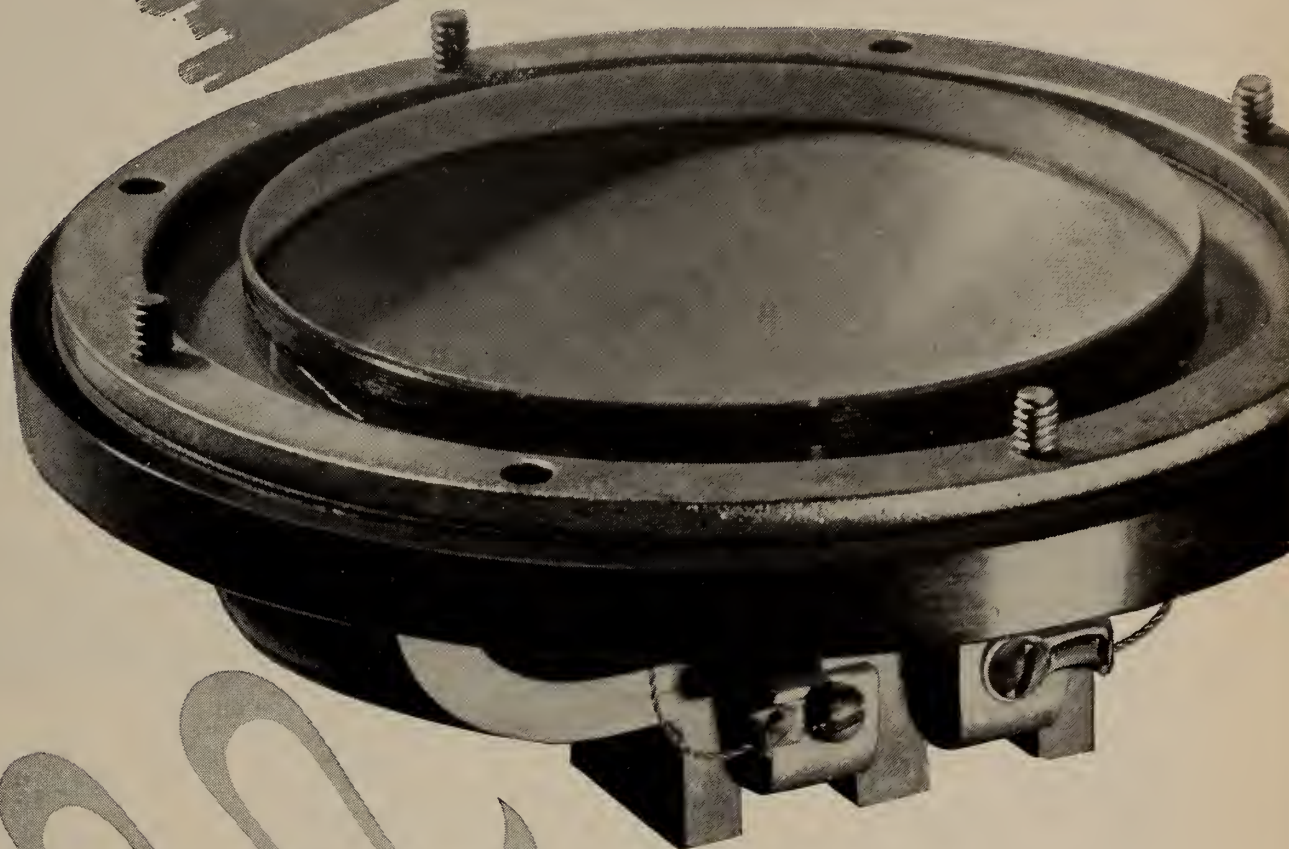
### **New 16-mm Projection Lenses**

There was a slight trend toward arrangements for mounting larger projector lenses having characteristics which will improve picture quality. For example, a new series of projection lenses for professional 16-mm use was announced by Bausch and Lomb. These Super-Cinephor lenses have a speed of F:1.6 and focal lengths of two to four inches in half-inch steps, will resolve 90 lines per mm, and provide practically uniform screen illumination.

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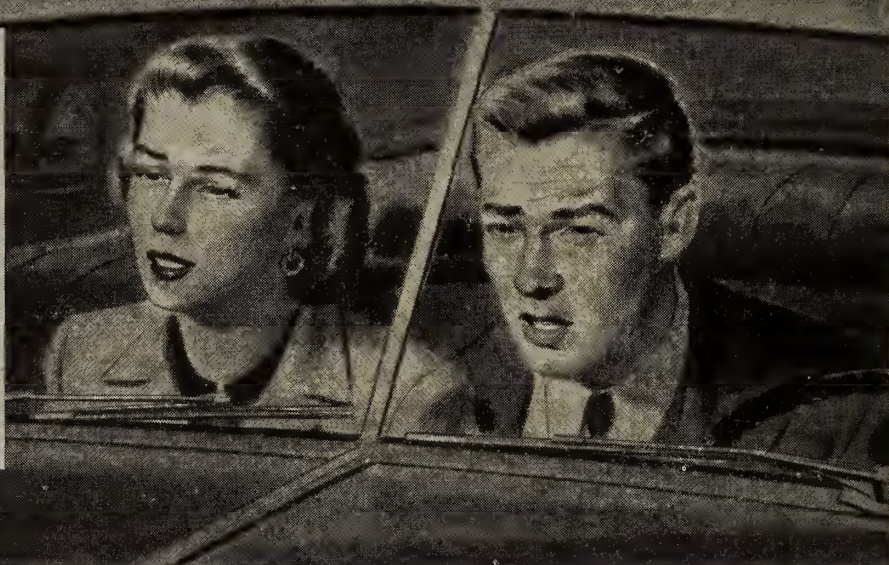
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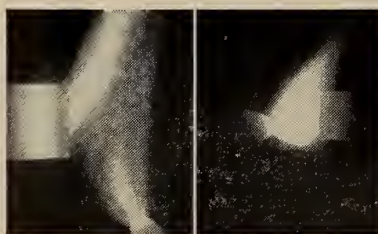
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# The Great Enigma: The Stereoscopic Perspective

By THEODORE NAKKEN

THE WRITER is aware that this article, in the eyes of the "experts," borders on heresy—this despite the fact that the stereoscopic perspective was first postulated by the celebrated Helmholtz (1821-94). This postulation was widely attacked and ridiculed even though Helmholtz made highly important contributions to stereoscopy.

The writer, however, felt that Helmholtz was right and devoted many years to the subject in order to find a suitable substitute for the geometric perspective.

## The Geometric Perspective

The geometric perspective is universally recognized as the only correct and undistorted one. It is widely used in the graphic arts, and is that produced by the photographic objective. The foremost task confronting a lens constructor when calculating a new objective is the attainment of this perspective.

Theoretically, a painter who desired to make a picture which would be faithful to the laws of true geometric perspective would have to undergo quite an ordeal. After choosing the point from which he wished to depict his subject he would place a transparency in a vertical position between this viewpoint and the scene.

An assistant then would clamp the painter's head rigidly facing the scene, after which the latter would place a covering over one of his eyes. The painter then would trace exactly the outlines and details of his subject on the transparency. If the tracing were done accurately, the finished picture would possess true undistorted geometric perspective.

Careful consideration of this procedure discloses some highly interesting facts. Evidently, clamping of the head would allow but a single motion, rotation of the eyeball, which is necessary in order to achieve sharp focusing of details. Rotating the eyeball in such a manner permits scanning all details individually and successively by the *fovea lutea*.\*

The eyeball, and therefore the eyelens and the *fovea lutea*, may be rotated with infinite freedom in all directions to make this scanning possible. However, since the eye proper is held stationary, it is obvious that the center of the eyeball becomes the point from which the scene is actually observed. The artist would trace, therefore, not the image cast on his retina by the eyelens (which is the image we see and experience at all times) but

*Teacher, lecturer, inventor, Theodore Nakken has had a long and varied career in the electro-optica-mechanical fields, ranging from wireless-controlled vessels and targetoes for the Czarist Russian government to numerous patents in the sound picture field. Outstanding among the latter was a photoelectric cell circuit which figured prominently in patent litigation in the 1930's.*

rather the successive scanning positions of his *fovea lutea* as details were being focused thereon.

From this it follows that the foveal image-in-time, which would be traced in projection on the transparency, is only half the size of the image normally cast by the eyelens. Moreover, as correctly stated by Helmholtz, its center of perspective is in the center of the eyeball.

The unavoidable conclusion to be drawn is that the artist would create in his tracing operation an enlargement of an image that he never "saw" in his life, because it would exist only in *time*, and one that he could not possibly ever "see." The picture, however, would have true, undistorted geometric perspective.

Painters greeted joyfully the invention of the camera obscura because it enabled them to trace the outlines of scenes on a screen upon which an image of the scene was cast by a stationary lens. This image, incidentally, has the same perfect geometric perspective as the image produced by a stationary single eye.

## Geometric Perspective Unsatisfactory

Formulation of the laws of perspective, begun toward the end of the Renaissance, represented a tremendous stride forward in picturization. Nevertheless, they were never adequate for the attainment of that which was actually needed. Leonardo Da Vinci (1452-1519) stated correctly that in order to appreciate fully a geometrically-constructed picture, it should be viewed with a single eye held in the identical position as described previously in the example of the painter producing the tracing. In that position alone would the tracing become an acceptable substitute for reality.

The growing appreciation of the importance of correct perspective was naturally reflected first in the graphic arts

field, for paintings, etchings and engravings. Collectors would view steel engravings in a so-called viewing box in which a picture holder could be moved forward and backward until the best perspective was attained. The important point here, however, is that the viewing was done with a *single eye* through a small hole in the rear of the box, thus insuring that the eye was positioned at the exact center of perspective.

In Europe there still are many different picture-viewing devices on the market; while the American version is the "scoper" in which Leica-size pictures or transparencies may be viewed, often with effects of startling realism or even three-dimensionality.

Very few people today are aware of the fundamental requisites for viewing pictures at their best. Every day we see pictures side by side which for real enjoyment should be viewed monocularly from wholly different distances. Thus the geometric perspective fails entirely to portray reality in a natural way with depth and solidity. This applies also to motion pictures. The inadequacy of the geometric perspective is felt keenly by all workers in the graphic arts field.

## Advent of the Stereoscope

The invention of the stereoscope in 1832 seemed to hold great promise. Here two pictures of the same subject are produced by means of two cameras spaced horizontally 6.5 cm apart, a distance equal to the average interpupillary separation of the eyes. These pictures, of course, are slightly different in the same way that the two images on the retinas of the eyes are slightly different from each other.

Just as a single picture viewed monocularly can be an adequate substitute for reality, so do these two pictures substitute for that which two eyes would see in a given scene—provided, of course, that the left and the right eyes view only the left and right pictures, respectively. When these two pictures are viewed under proper conditions, the effect is one of startling realism.

Why should this be so?

In normal vision scenes are imaged by the eyelenses on the two retinas, the sensitive elements of which are individually connected, by means of nerve strands, to the visual perception center of the brain, often called the *cortical retina*. Should these interconnecting nerve strands be-

\* The only point of the retina, directly in the axis of vision, where sharp focusing of minute details can be accomplished.

come severed or diseased, partial or even total blindness results, even if both eyes appear completely normal.

In the cortical retina the two images merge and are impinged on the consciousness as a single image instead of two separate and distinct images. This ability of the cortical retina or brain appears miraculous when contrasted with the results obtained when other means are employed to attain the same end—a jumbled, confusing double picture.

In the stereoscope two pictures are presented to the eyes under almost identical circumstances, as when Nature is normally observed binocularly. Obviously, the same process of merging two images with identical spatial sensations occurs in the cortical retina. Braving further criticism, the writer is of the opinion that that which happens in this process is not miraculous at all but is most natural and to be expected, and, further, that no unknown factors affect a simple explanation of the merging process.

### Stereoscope Viewing Process

It has been established definitely that the eye possesses only a single spot in the retina where sharp focusing is possible, the *fovea lutea*, which serves as a scanning device to so sweep a scene as to cause individual sharp imaging of detail.

Immediately outside the fovea there is no sharpness of the retinal image. For example, if the reader will focus sharply on either dot of the following colon — : —, he will perceive that the other dot is out of focus and has lost its sharp outline.

Clearly, then, when viewing a scene one sees only a single detail with great acuity, the surroundings becoming progressively more hazy with distance from that detail. In fact, by simply concentrating on one object in a scene, everything surrounding that object becomes hazy in outline to the point of non-recognition. The fact that we seem to see the entire scene sharply is due to the very rapid scanning motion of the eye which brings successive details into sharp focus.

When a scene is viewed binocularly, the foveas of both eyes scan the same details simultaneously. The areas immediately surrounding these details are naturally hazy in both eyes, the merging of these hazily-seen surroundings resulting in a new impression with a "mixed" perspective, the confusion and haziness of which, however, is not much greater than in each retinal image separately.

It seems clear, therefore, that while details are seen sharply and as well-defined entities, they are surrounded by a vaguely-perceived background which is a mixture of the perspectives seen by the eyes separately. This hazy, mixed per-

spective, and the doubling effects occurring farther away from the sharp foveal impressions, are experienced as the stereoscopic perspective. The sharply observed cortical image, composed of details viewed binocularly, is assembled in an amazingly fast manner.

### Binocular Vision

It is the writer's opinion that the binocular sensation of depth, solidity and space results from the fact that the sharply-seen cortical image is *not* a merger of two dissimilar images but is rather an image built up in the manner described from details, each one of which was seen in merged, stereoscopic surroundings.

The passing years witnessing no advance in the understanding of the nature of stereoscopic vision as such, there developed the conviction in the minds of workers in the art that three-dimensional vision could be attained only by the merger in the brain of two separate parallaxially-different images. They ignored the simple fact that one-eyed drivers apparently are as good judges of space and distance as are two-eyed drivers, and that there are first-rate tennis players and other athletes who hit the ball consistently, despite the lack of stereo vision.

Many years ago the writer coined the term "trimensional perspective," which will be encountered several times herein, and the characteristics of which may be

about equal to or somewhat less than the interpupillary distance of the eyes.

### Graphical Representation

In Fig. 1 two eyes, 1 and 2 represented by dots are placed rather close together and look at objects A, B and C in a scene placed at an appreciable distance from the eyes. The figure represents a top view of eyes and scene; the objects, shown as circles, might be three round tables or have any other conceivable shape.

When both eyes look toward object A, it is clear that left eye 1 will see more of this object on the left side, and, conversely, that right eye 2 will see more of this object on the right side. This is apparent from the lines of vision drawn through the two eyes tangent to object A. Obviously, the two extreme lines of vision embrace more of the object than the lines of vision of either one of the two eyes. When now we extend these two extreme lines of vision, we find that they cross each other at point *a* located behind the eye base and on the side of the centerline opposite to that in which the object is located.

### How Objects Are Seen

Now, if a single eye were placed at this crossover point *a*, it would view object A while embracing as much of its girth as do the two eyes 1 and 2. Thus point *a* may be designated the *equivalent viewing point* for eyes 1 and 2 with respect to object A, because from there a single eye sees the object along the extreme lines of vision of the two eyes.

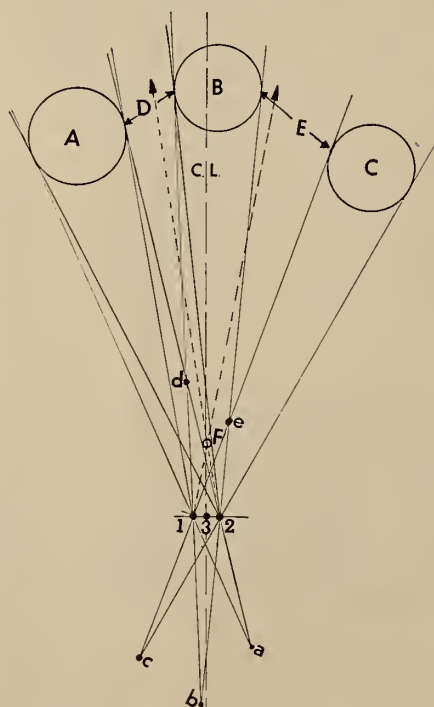
The extreme lines of vision for the two eyes viewing object B reveal the existence of another equivalent viewing point, *b*; and similarly we find an equivalent viewing point *c* for object C.

Looking at the lines of vision from these equivalent viewpoints, and at the lines of vision from either one of the eyes, we find that in each case the object obtends an angle which is smaller, in the case of the equivalent viewpoints, than in the case of either eye viewing a particular object. Hence, as the angle obtended by an object is the sole factor which determines its linear dimension in an image, it is clear that all objects are seen narrower in binocular than in monocular viewing.

The word "narrower" is used advisedly because vertically both eyes are on the same level and thus see the *vertical* characteristics of an object (and space) under identical angles. Therefore, as far as vertical phenomena are concerned, we might just as well have a single eye at point 3.

Pausing here a moment, we might consider that in a single stroke we have unraveled part of the enigma of binocular vision. We find that in the perspective created binocularly there is but a single

FIGURE 1



recognized and derived by diligent consideration of Fig. 1.

This diagram differs from those used in optical texts in which, generally, two colossal eyes are shown looking cross-eyed at a very small object at a distance

vertical center of vision or perspective; while there is a plurality of horizontal centers of vision, these being the equivalent viewing points for the two eyes for each and every object in a scene.

### Narrowing of Objects

We find, further, that in the binocular perspective objects are imaged narrower than in the geometric perspective, because horizontally these objects obtend smaller angles than those obtended in the monocular, geometric perspective. We know also that objects to the right of center in a scene are seen, in the binocular perspective, from the left of center; while objects in the left of the scene are viewed from the right.

However, the difference in angles obtended in the two different kinds of perspective may become so small as to be insignificant. This happens when this difference becomes less than the angle of the retinal curve obtended by a single visual element, because then no difference in dimension can be observed anymore, according to the teachings of conventional stereoscopists. This occurs when light rays from the objects reach the eyes substantially as parallel rays, which happens with increase in distance of the objects.

Thus at the "critical stereoscopic distance" this difference in angle obtended disappears, and the binocular perspective merges into the geometric perspective. The narrowing down, or slenderizing, of the images of objects is strongest for nearby objects, decreases gradually with distance, at last to become zero.

### How Interspaces Are Seen

Returning to Fig. 1, we now will consider another, and extremely interesting, fact. Between objects A and B there is a space, designated by D; and between objects B and C there is a space, E. Close inspection reveals that the two eyes, looking through these interspaces at the background, again do so binocularly and show, once more, extreme lines of vision.

For space D these extreme lines of vision are the line drawn from left eye 1 tangent to the left side of object B, and the line drawn from right eye 2 tangent to the right side of object A. These two extreme lines of vision cross each other at point *d*, which, therefore, is the point from which a single eye would look through the interspace between objects A and B, in the same manner as do the two eyes 1 and 2.

### Spaces Seen Wider

Point *d*, therefore, may be designated as the equivalent point of vision for the eyes 1 and 2, as regards interspace D. For space E we find, in an exactly similar manner, an equivalent viewpoint *e*, from which a single eye would see this space

in the same manner as do the two eyes 1 and 2.

In the case of these equivalent viewpoints for interspace we find, however, that they are located in front of the eye baseline. Moreover, we see that the angles obtended by the interspace from these points are larger than those from either one of the two eyes. This means, of course, that the interspaces are seen in widened proportions, in contradistinction to the slenderizing effect we found to occur with objects. Again, the term "widening of the interspaces" is used advisedly, because, vertically, there still is no change in proportions, as vertically the eyes are on the same level.

Expressed simply, we find that in binocular vision we look through the interspaces between objects from a multitude of points located in front of the eye base, and under wider angles, so that, binocularly, we are enabled to see more of the background than is possible with either eye.

Again, this increase of angle with which in binocular vision we look through interspaces, decreases with distance until, beyond the critical distance discussed previously, the difference in angles obtended by spaces becomes equivalent to zero. Hence this cause for stereo vision also ceases to exist at the critical distance.

We are now in a position to define clearly the difference between the perspective seen in binocular vision and the geometric, or monocular, perspective.

### The Stereoscopic Perspective

In the latter, there is but a single viewing center or center of perspective, i.e., the center of the eyeball, or the objective of a camera; while the former possesses three different kinds of viewpoints: first, a single center of perspective in the vertical sense, which may be said to be located at a point midway between the two eyes; second, a group of viewpoints for objects, located behind the eye baseline on the opposite side of the centerline to that on which the objects are located; third, a group of viewpoints located in front of this baseline from which interspaces are viewed, on the same side of the center line as these interspaces themselves.

It follows that as a result of the widely different locations of these various viewing points, the binocular perspective is totally different from the monocular, geometric perspective. As was shown, objects are slenderized, by a given percentage, which is greatest for nearby objects and decreases with distance. Conversely, interspaces are widened, by a given percentage, which again is greatest for spaces between nearby objects and again decreases with distance. Beyond the critical stereoscopic distance, however, both

objects and interspaces are seen with the geometric perspective.

### 'Looking Around' Objects

Expressing these facts differently: it is often stated that when looking at Nature or in the stereoscope, we "look around" objects in the foreground. Of course, as the distance of these objects increases, this "looking around" effect decreases and gradually disappears, to become zero at the critical distance.

Now, if one looks around an object in the foreground, one must see more of the background: Fig. 1 shows that this is exactly what happens, due to the slenderizing of foreground objects and the location of the interspace viewing points, from which "more" of the background is visible than from the location of either one of the eyes.

Between the extreme narrowing down of objects and widening of interspaces and the geometric, monocular aspect beyond the critical distance, there exist, of course, an infinite number of gradations. In practical terms this means that, for instance, when a person is seen at a distance of 10 feet he appears more slender than when seen at 20 feet, and that at 20 feet he appears to be more slender than when seen at 50 feet distant; while after the critical distance is reached, the person is seen in the proportions which, in the geometric perspective, obtain at any and all distances.

It is quite evident, of course, that the facts here enumerated lend themselves to exact mathematical analysis. Taking the interpupillary distance at an average of 6.5 cm, the percentage of slenderizing effect may be calculated for any chosen distance, as may the opening up of the interspacings in the binocular image.

### The Double-Image Effect

There is one special case to be considered in connection with the stereoscopic perspective, relating to what happens when very narrow objects are seen at an extremely short distance. Such an object is shown in Fig. 1 at F. Obviously, in order to view this object sharply binocularly, the eyes must assume a cross-eyed position. When they do this, the background becomes at once jumbled and doubled up. If, however, one focuses the eyes on an object in the background, the object is projected into the background twice. This is the case shown in Fig. 1.

This fact can be easily proven by a simple experiment. While facing a room, for instance, one holds a pencil in vertical position in front of the eyes and focuses on it. At once the doubling up and jumbling of the room becomes apparent. When then the eyes are focussed on any one object in the room in the

(Continued on page 23)

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**R**ECESION vs. REISSUES. The never-ending gab in the trade and lay press and over the air about the "recession" which has hit the motion picture business, particularly the theatre field; the sad tale of a friend of ours who until recently was an inveterate moviegoer, and a couple of incidents dredged up from our own memory dovetail nicely to point up one of the most asinine practices of the great minds (in a cunning, perfidious sort of way) which direct the affairs of this industry of ours.

Our friend's story, related in burning words, recounts his experiences which goaded him into keeping tabs over a period of eight weeks on a theatre in his neighborhood catering to middle-class patronage—a theatre seating about 700 which, incidentally, is nicely appointed throughout, spotlessly clean, comfortably seated, courteously staffed and air-conditioned.

Over an eight-weeks period during June and July, reports our friend, this theatre gave over 24 of its playdates to reissues of varying vintages extending from 1935 to several years ago! This without a word of explanation in their trailers, printed programs or lobby displays—and, naturally, at the regular 60c admission charged for current, although *third-run*, offerings.

The theatre management did make a publicity fuss when it resealed the balcony, dubbed it a "loge" and upped the price therefore a dime to 70c.

Nor is this the whole story. Sound reproduction is very poor in most reissues because of the shrinkage of the negative. So bad is this shrinkage in some cases that picture frames in positive prints fail to fill the projector aperture, resulting in light streaks at the screen borders!

As of August 1, Columbia Pictures Corp. placed into general release no less than 43 reissues. Multiply this figure, for a seven-month period, by only the Big 5 distributors, and draw your own conclusions. Nor is this condition confined to the New York Area: there were 18 reissues in the Chicago area during one month, July!

Maybe this isn't the most important reason why the movie theatre is losing its regular customers, but to our mind it represents 42%—the reissue percentage—of the reason.

P. S. Our friend is no longer a regular moviegoer, and, possibly, neither are the numerous people who have heard him blast the industry.

• Our good friend, Z. A. Sax, business manager for Local 159, Portland, Ore., reports the satisfactory settlement of all

wage negotiations with the exhibitors in his jurisdiction. Increases ranging from 10 to 20c per hour were agreed upon, with all increases retroactive to February 1949. Orin Jacobsen, IA representative, assisted Local 159 officials in the negotiations.

• Bob Dennis and Gene Muller, members of San Antonio Local 407, report excellent business at their new drive-in theatre, The Variety.

• John Q. Bluenose stalked the town of Hattiesburg, Miss., recently when the city fathers suddenly were "inspired" to enforce the long-dormant Blue Laws by the wholesale arrests of theatre employees found working after 6 p. m. on Sundays. Every hour the police appeared at the theatres and hustled off the staff to the hoosegow, only to have standby crews immediately step into the breach and keep the shows going.

Although the shuttle service between theatres and the police station was marked by good nature on both sides, the exhibitors finally got tired of paying fines and filing briefs and threw in the sponge. Exhibitors promise that these Blue Laws will be repealed—and soon.

• Congratulations to Harry Abbott, president of Philadelphia Local 307, on the graduation of his son, Frank H., from the Temple University Law School.

• We were very much interested in the statement released by Republic Pictures Corp. in which they report a net profit of \$504,456.77 for the 28 weeks ending April 30, 1949, *after taxes*. The net profit for a similar period in 1948 was \$236,832.85.

Reconcile these figures, if you can, with Republic's cries of distress a few months back when they sought long and strenuously to cut down projectionist manpower in their New York City preview studio. 'Twas ever thus, and likely always will be.

• Bert Sanford, director of sales for Altec Service Corp. for the past 20 years and member of the 25-30 Club, has been appointed general sales manager for the ABC Vending Corp. The ABC outfit,

## SCENE AT THE RECENT TMA GRAND LODGE MEETING IN NEW YORK CITY



In the usual order, Sec.-Treas. Phil Hitter, Lodge 67, Long Island; Frank Golluzzo, Lodge 4, Chicago, who is shown presenting on honorary life membership in the Grand Lodge to Harry Sherman, of IP; President William Noon, Lodge 1, New York City; IA President Dick Walsh, honorary member of Grand Lodge, and J. Dwyer, Lodge 1, New York City.

which is headed by Charles L. O'Reilly, former theatre exhibitor in New York City, owns the various candy and popcorn machines now an integral part of motion picture theatre lobbies.

- Canadian Locals 302 (Calgary) and 371 (Edmonton) have joined forces to fight the exhibitors' efforts to reduce the projection room manpower in the Province of Alberta. We were privileged to see a copy of the brief prepared by these Locals, and we congratulate them for the excellent manner in which they presented their story. The case is now pending before the Provincial authorities, and the officers and members of both Locals are very optimistic as to the outcome.

- An eye operation bedded our good friend, Joe Nuzzolo, Sr., president of Boston Local 182. Several weeks rest put Joe in shape again, and he is now back on the job as bright and chipper as ever.

- Bob Gellatly 57, secretary-treasurer for many years of Local 85, Ottawa, Canada, died recently after a brief illness. For the past seven years he was a supervisor with the National Film Board, and previous to that he worked at the Avalon Theatre in Ottawa.

- Not infrequently the gracious gesture recoils on its maker with disastrous results, as was demonstrated by Tom Neathery, old-line member of Local 384, Hudson County, N. J., and a standup member of the 25-30 Club.

While visiting his sister in Virginia, Tom, characteristically, decided to install the house window screens. With only two screens to go, Tom fell from a ladder and incurred six broken ribs and an injured shoulder. Tom is on the mend now, but he entertains no notions of going into the contracting business—at least not in Virginia.

- The TMA (Theatrical Mutual Association) held its 1949 meeting last month at the Claridge Hotel, New York City. Ambitious plans have been made for revitalizing this organization, once the outstanding association of mechanical and technical workers in the amusement field. During the past few years many new Lodges have been formed throughout the country and the membership rolls have increased considerably.

Several hundred members and guests were present at the obligation of the newly-elected Grand Lodge officers. Among the invited guests were IA President Walsh; Judge Joseph McKinney, a boyhood friend of the new president, Bill Noon, and C. B. Stiff, former district manager for the Minnesota Amusement Co. After the induction of officers, President Noon presented Judge McKinney and yours truly with TMA life membership cards.

## TYPICAL LONE-STAR STATE HOSPITALITY



While attending the State Federation of Labor convention in Beaumont, Texas, IA President Walsh was presented with gold cuff links and tie clasp, emblematic of the State of Texas (what else?) by J. H. Fehl, Secretary-Treasurer of Beaumont Local 183.

One of the busiest guys at the meeting was Frank Galluzzo, former Grand Lodge secretary-treasurer. However, at the close of the sessions we carried Frank off on a sightseeing tour which wound up at Coney Island. We enjoyed meeting many friends of our early days, among them being Jim Perry, Local 169, Oakland, Calif., and Luke Callahan, Cincinnati, Local 5.

Grand Lodge officers elected for two year terms, 1949-1951, are: president, WM. R. NOON (Lodge 1, NYC); 1st vice-president, WALLY YOUNG (Lodge 1, NYC); 2nd vice-president, W. C. MUELLER (Lodge 4, Chicago); 3rd vice-president, JAMES PERRY (Lodge 26, Oakland); 4th vice-president, W. C. ROCKWOOD (Lodge 11, Toronto); 5th vice-president, JOSEPH MCCARTHY (Lodge 1, NYC); 6th vice-president, LUKE CALLAHAN (Lodge 33, Cincinnati); 7th vice-president, MARCUS RATTINER (Lodge 1, NYC); secretary-treasurer, PHILIP HITTER (Lodge 67, Long Island); trustees, EDWARD SCHNEIDER (Lodge 38, Bronx), WW. W. FRIEDMAN (Lodge 67, Long Is-

land; JOE SCHNEIDER (Lodge 30, Brooklyn); PAUL STAHL (Lodge 1, NYC); JAMES SULLIVAN (Lodge 1, NYC); ALBERT FRIED (Lodge 30, Brooklyn); NAT NADEL (Lodge 67, Long Island); chaplain, THOMAS LLOYD (Lodge 67, Long Island); laws, appeals and grievance committee, JAMES DWYER (Lodge 1, NYC); CHARLES EICHORN (Lodge 67, Long Island); FRANK GALLUZZO (Lodge 4, Chicago); marshal, JAMES P. PARE (Lodge 38, Bronx); and tiler, GEORGE POSTEL (Lodge 33, Cincinnati).

- Recent out-of-town visitors: Harry Strong, president of the Strong Electric Corp., manufacturers of the famous Strong arc lamps, the Strong spotlights, and other projection equipment, dovetailed his 41st wedding anniversary with a visit to the offices of IP. In our discussions about various technical phases of the industry, Harry waxed most enthusiastic about his new 1950 lamp, which, he promises, will establish new high standards of screen illumination.

Accompanied by National Carbon's Bill Kunzmann, Pete Mole, head of Mole-Richardson Co., West Coast manufacturers of photographic lighting equipment, paid us a visit shortly after landing in New York from a three-months' tour of Europe. Pete enjoyed his European jaunt immensely. Some of his experiences, as he related them, would constitute a pleasant evening's entertainment in any company.

Charlie Hahn, president of J. E. McAuley Mfg. Co., makers of Peerless Magnarc lamps, also paid us a visit and had some very interesting comments to make on the controversial topic of cooling agents for film equipment. His comments will be included in a symposium on this subject in our next issue.

Lawrence Sherman, Syracuse Local 376; Russ Rubin, Detroit Local 199; Joe Caplan, Boston Local 182, and Frank Galluzzo, Chicago Local 110, also stopped in to say hello to the IP staff.

## IA ELECTIONS

### LOCAL 38, DETROIT, MICH.

E. CLYDE ADLER, pres.; C. APCAR, 1st vice-pres.; A. FINLEY, 2nd vice-pres.; GEO. GLENWALLIS, sec.; S. L. DAY, SR., treas.; JERRY BRIC, bus. mgr.; Ed McMILLEN, sgt.-at-arms.

### LOCAL 412, SARASOTA, FLA.

B. A. BONNETT, pres.; B. BROLLIER, vice-pres.; J. E. SANDERS, sec.-treas.; J. A. SCOBIE, bus. mgr.; E. J. GALLAGHER, sgt.-at-arms; SCOBIE and GALLAGHER, del. to Central Labor Union.

### LOCAL 597, WACO, TEXAS

H. C. FUSTON, pres.; E. F. ROBERTS, vice-pres.; W. R. FOSTER, rec.-sec.; A. M. PUDIC, fin.-sec.; W. H. YOPP, sgt.-at-arms; E. F. ROBERTS, S. E. BURDETTE, and J. G. DANIELS, trustees.

## RCA's New Plan for Servicing of Drive-In Speakers, Boxes

RCA Service Co. is now offering a plan for the servicing of drive-in theatre in-car speakers and junction boxes, for a nominal flat rate per week. The plan includes parts replacement, labor and material costs, shipping containers, and prepaid transportation both ways on repaired speakers.

The plan aims to free exhibitors from the need for arranging for repairs and the stocking of parts. Contract payments are suspended during off-season months.

## Loew's Profit Up Over '48

Loew's, Inc. in the 40 weeks ending June 9 last had a net profit after taxes of \$5,160,773, which is \$431,710 greater than in the comparable period last year.

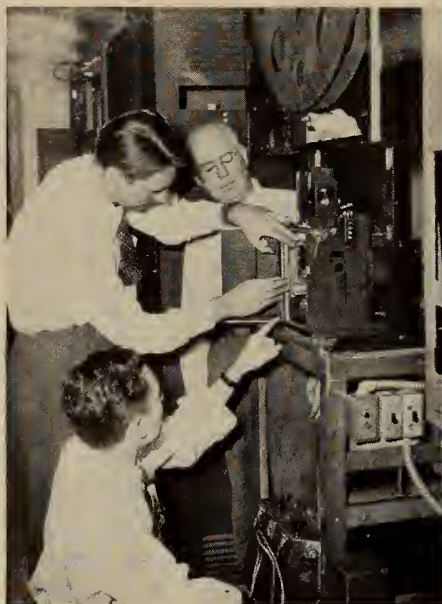


Figure 1



Figure 2

## Chicago Theatre-WBKB Intermediate Full-Screen Tv-Film System

WITH the intermediate film-television system at the Paramount Theatre in New York City shrouded in secrecy (the regular theatre projection crew may not enter the area where the equipment is installed) IP turned to Gene Atkinson, business manager for Local 110, for an elaboration of a picture layout of the WBKB (Tv)-Chicago Theatre film-Tv system which appeared in *Television Forecast*.\*

Since Local 110 long since rejected the absurd argument that only "qualified technicians with special training and aptitude" (meaning non-IA men, of course) could handle Tv equipment, Atkinson was able to commission two Local 110 members to supply the notes on which this article is based. These men, Bobby Burns and Ira Jacobsen, have proved over a period of many months that members of regular IA projectionist Locals need not give way to any other group when it comes to doing a fine job on such set-ups.

### Moderate Space Available in Any Modern Theatre

The Chicago Theatre system is an improved version of the intermediate film equipment installed in the Paramount Theatre in New York. No apparatus is required to be set up in the theatre auditorium, and no additional space is needed backstage. It seems safe to say that any fairly modern theatre could provide the necessary space for this equipment. At the Chicago Theatre a room formerly used as a music library was slightly enlarged and serves the purpose very well.

Basically, the Chicago Theatre system comprises a Tv receiver with circuitry so arranged that either a negative or a positive image may be made to appear on the cathode ray tube. This image is then photographed by an Ackley camera which utilizes an electronic shutter. This camera alone is valued at \$11,000.

Synchronous power supplies for the image recorder and the shutter, together with the synchronizing Tv generator, establish the basic frequency rates, and no interlocking of the monitor and the image recorder is necessary. The developing machine is a high-speed device capable of processing the film in 40 sec-

onds! The film travels through three vertical, stainless-steel cabinets for developing, washing and fixing, respectively, and thence over a drying frame. Within 66 seconds from the photographing of the Tv image, the film is projected upon the theatre screen bearing a 26-foot image!

Any cathode ray tube produced by a reputable Tv equipment manufacturer for video recording may be used. DuPont

or Eastman fine-grain master positive film may be used for either the negative or positive recordings.

Burns and Jacobsen find that a monitoring projector and a screen directly in line with and following the processing machine is indispensable for best results. They also favor the use of a standard soundhead on this projector. Synchronous motors, while not used in the Chicago Theatre set-up, are recommended for this

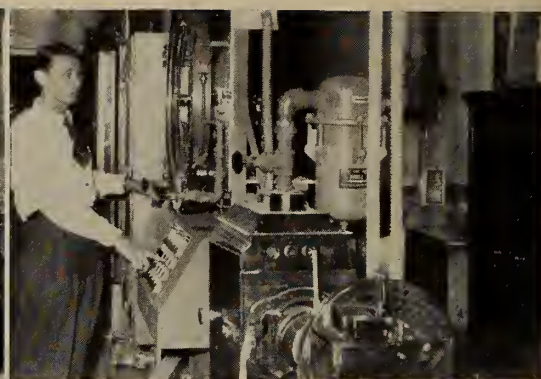


Figure 3

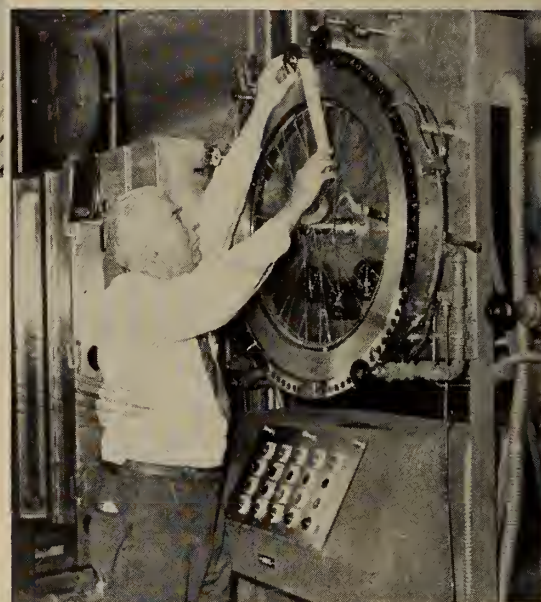


Figure 4

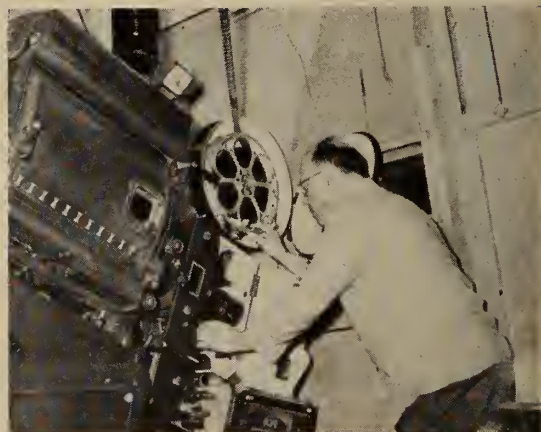


Figure 5

\* Published weekly at 185 No. Wabash Ave., Chicago.

projector as well as for the projector in the theatre projection room.

A graphical exposition of the step-by-step procedure in "snatching" a Tv image off the air, imprisoning it upon film and projecting it onto the 26-foot screen appears on this page. Fig. 1 shows (upper) Jacobsen and Burns and (lower) Carl Maurer (IA Lab. Technicians Local 702) threading the recording camera. Incidentally, this camera was developed by Maurer.

Figure 2 shows the film beginning its long trip through the intermediate system, moving out of the camera into the processor. Jacobsen is shown threading the tension takeup loop of the processing unit.

### Film Dried Within 10 Seconds!

Not a bicycle wheel (Fig. 3) but a large drying cylinder is this device through which the wet film travels and is dried by jets of hot air within 10 seconds. Here Burns is shown getting the film into proper positioning for its unbroken run to the theatre projection room 20 yards distant from the teletranscription room. In Fig. 4 Jacobsen is shown at the control panel (directly under the drying unit) which regulates the speed of the film as it heads for the theatre projection room.

Arriving in the projection room and still untouched by human hands is a thoroughly dry, high-quality, 35-mm print containing both sight and sound records—the same as a conventional theatre projection print. Note entry of the film into the upper magazine of the projector (Fig. 5) which is being threaded by Art Devent, Chicago Theatre staff projectionist and, of course, a member of Local 110.

### Variety of Program Pickups

Providing that proper authorization is forthcoming from the Federal Communications Commission, the Chicago Theatre and the WBKB staffs are prepared to handle programs for theatres in any one of a variety of ways:

1. A telecast from WBKB may be picked up by a conventional type antenna.
2. A telecast may be "piped" from WBKB to the theatre recorder via matched telephone lines or by microwave relay from station roof to theatre roof.
3. A Tv network's coaxial cable distribution system may be fed to the theatre via telephone lines.
4. A sports event may be picked up privately by the Chicago Theatre's own mobile camera chain and flashed to the screen.
5. A studio show may be picked up privately by the Chicago Theatre's own studio camera and then "piped" over a

## The Origins of the 'Magic Lantern'<sup>†</sup>

A critical survey of old and new literature reveals the development of the modern slide projector out of the old "ort of mirror writing", which in its turn can be derived from the silhouette. A wrong interpretation of a passage in an old book which describes a camera obscura caused the wrong opinion that the slide projector must have developed therefrom.

This contrivance, however, was the forerunner of the modern photographic camera.

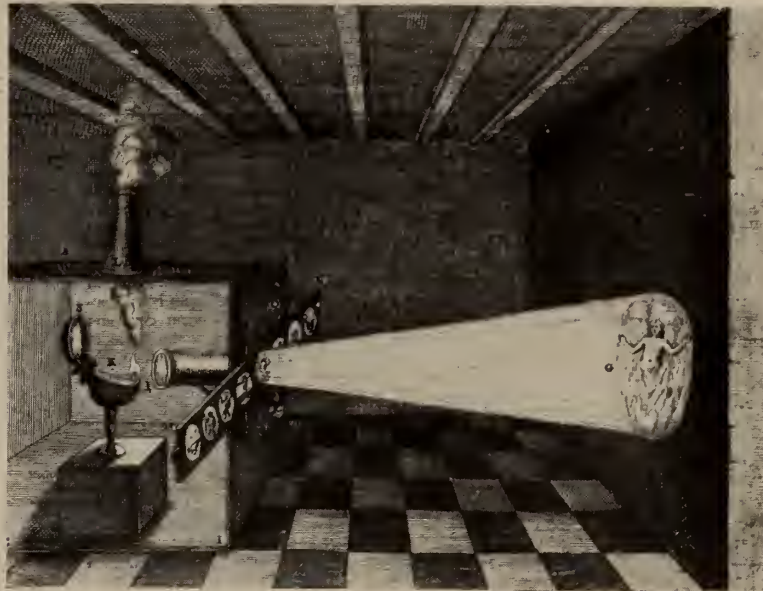


FIG. 1. Representation of Kircher's 'Magic Lantern' (1671).

By J. VOSKUIL

Research Chemist, Geldermalsen, Holland

IT IS usually held that the slide projector, formerly called the "magic lantern" has its origin in the "camera obscura," and in this connection the names of Porta (1538-1615) and of Athanasius Kircher (1602-1675) are mentioned. The latter was alleged to have constructed the magic lantern in the middle of the 17th century. He described it in the *second edition* of the voluminous and abundantly illustrated "Ars Magna Lucis et Umbræ" ("The Great Art of Light and Shadow," 1671) accompanying which were two illustrations, one of which is shown in Fig. 1.

### Principles of the Camera Obscura

A closer study of the literature of this subject, however, reveals another origin of the magic lantern, which may be traced back to the very old "silhouette show," and in this development the importance of Kircher and Porta is not so great as is generally accepted.

<sup>†</sup> J. Soc. M. P. Eng., Dec., 1948.

Before we continue with the subject, an explanatory remark should be made on the principles of the camera obscura and the modern projector. The latter forms by means of a lens, the objective, a *real* inverted image of an object, which therefore can be projected on a screen. The nearer the object (slide, film) to the focus of the objective, the larger the image on the screen and the larger the distance between screen and objective. Thus in slide and film projectors the slide or the film is placed practically in the focus of the projecting lens.

By moving the object from the objective, the image will become smaller and smaller until it stands practically in focus when the object is at a great distance from the lens. In this way we have changed the projector into the camera obscura, and therefore the essential difference between the camera obscura and the magic lantern lies in the position of the object before the lens.

The Italian Porta, who lived long after the invention of the camera obscura and

(Continued on page 29)

closed circuit to the film recorder.

Justifiably proud of their participation in this new form of entertainment transmission, the Local 110 fellows involved are most articulate when discussing how they successfully resisted the onslaughts of other crafts, as well as of unaffiliated

"engineers," which sought jurisdiction over this form of Tv work. "Tv is just another type of show business," say the Chicago boys, "and there's no type of show business work that we can't do not only just as well but *better* than any other craft group."



# TELECASTS

## Final Decision Nears on the Future of Theatre Tv

**J**ULY marked an important milestone in the history of theatre Tv when the Federal Communications Commission called upon 20th Century-Fox Film Corp. and Paramount Television Productions, the only licensees of experimental theatre Tv stations, and the Society of Motion Picture Engineers to submit comprehensive data on frequency needs and plans so that the Commission can formulate rules and standards for a full-fledged nationwide theatre Tv service.

Shortly after this call by the FCC, the Motion Picture Association (Johnston organization), composed of top producing and distributing companies, petitioned the FCC for public hearings looking toward the allocation of channels for instituting a national theatre Tv set-up.

Obviously, the motion picture industry was on the verge of emerging from its self-spun cocoon of indifference when the call came from the FCC, but the latter's action in asking for basic data as to the intent of the film industry served to spur the heretofore laggard film companies.

### First Theatre Tv Contract Set

Almost simultaneously with the aforementioned moves came the announcement of the signing of the first contract for the permanent installation of RCA's instantaneous projection equipment, producing 15 x 20 foot Tv pictures, in the Fox Theatre, Brooklyn, scene of the recent showing of the Walcott-Charles fight pictures via a temporary theatre Tv setup.

Of special significance was the inclusion in the FCC statement of a query bearing on whether common carrier relay facilities (Bell System) can handle theatre Tv broadcasts or if there is a place for regular theatre Tv video relay service. This point is known to have been discussed at length in the various meetings of exhibitors, technicians and film company representatives.

Immediately following the FCC pronouncement came word from the SMPE that a comprehensive reply to all questions posed would be in the hands of the FCC by the Sept. 2 deadline. Although separate briefs will undoubtedly be filed by all three respondents, it is a foregone conclusion that all segments of the industry will get together and agree in advance as to just what requests will be

submitted for Commission consideration.

Installation of the Tv equipment in the Fox Theatre (4100 seats) will be made within six months, it was announced. Although similar in principle and construction to the RCA experimental theatre Tv projector used for the fight pictures, the production model covered by the contract will employ a larger spherical mirror (28 inches instead of 20) to achieve a 60-foot projection throw. This will permit mounting of the optical barrel directly on the front of the balcony, without an extension platform.

### Projectionist Control Implied

RCA stated that "the control console and all amplifiers, power supplies, and associated equipment will be located *outside* the theatre auditorium"; but IP interprets this to mean that these units will be installed in the projection room via a run of coaxial cable and will be operated by the regular theatre projection crew. (see IP for July, p. 18).

Chief concern of the movie theatre field anent Tv was succinctly expressed recently by Si Fabian, owner of the Fox Theatre, as follows:

### Programming Chief Concern

"The whole thing is like chasing your own tail around. To meet the cost of equipment (about \$25,000 plus installation) you have to have some guarantee of large-screen programming that will draw. On the other hand, the manufacturers won't go ahead unless they first receive a large bulk of orders. The net result is that the exhibitor is afraid to order equipment without assurances of program supply, and the manufacturer is afraid to make sets without those orders."

This concern was pointed up by one of Fabian's first moves after inking the RCA contract. His appeal to National Broadcasting Co. for data on possible program material elicited a prompt re-

### Government Color Tv Committee

The National Bureau of Standards has organized a Color Tv Committee to survey the present status and future prospects of color Tv. The committee will confine its attention to the scientific and technical phases of the problem, reporting to Senator Johnson (Col.), chairman of the Senate Committee on Interstate and Foreign Commerce.

sponse from Charles R. Denny, web vice president, that NBC would be pleased to give quotations on the production of "specific programs to fit your *specific* needs."

As to whether NBC will make available to theatres such network programs as may be requested, Denny said that this angle would induce "some extremely complicated problems. In a great number of instances special clearances for theatres would have to be obtained, and in many cases it may be impossible or impracticable for us to obtain them.

"Nevertheless," concluded the NBC executive, "we will do what we reasonably can to obtain or assist you in obtaining appropriate rights. . . ."

### General Uncertainty Prevails

This is small comfort to any exhibitor with a \$25,000 investment for Tv equipment, was the general industry opinion, quite apart from the certainty that any network Tv programs that might be released to theatres would inevitably contain every visual and spoken commercial plug for a given program's sponsor.

While July was a notable month in the continuing struggle between home and theatre Tv, September will see the motion picture theatres' case pleaded with the utmost vigor before the FCC, and late Fall likely will mark the period when the final decision is rendered as to whether the Fabian or any other theatre will need worry further about Tv equipment; in fact, whether the motion picture industry as a whole will have to go along on its present basis of straight film fare.

• • •

### Zenith Asks Phonevision OK

Zenith Radio has asked the FCC to permit a three-month trial of Phonevision. About 250 subscribers in the Lakeview telephone exchange in the Chicago area would receive a Zenith receiver with the needed equipment, and special telephone lines would be installed.

### How Phonevision Works

Zenith's Chicago station, W9XZV, would be used for the transmission of frequent exclusive programs which would come in scrambled on all sets not equipped with Phonevision; while subscribers to the system would simply call the telephone company and ask for one of the available programs. Thereupon, a special signal is transmitted from the

telephone company, electronically releasing a key in the Phonevision unit of the subscriber's set, and the program can then be received. Any set can be equipped with the necessary Phonevision unit, Zenith said.

Plan would permit a subscriber to select only those offerings in which he is interested, with monthly billings being made on the basis of programs for which the special un-scrambling signal has been given.

### Another Inconclusive Tv Survey

Tv has little effect upon motion picture attendance among those families who have owned their sets more than a year, according to a study completed recently by the Psychology Dept. of Princeton University. Among those who have had their Tv receivers for from one to nine years, reports *Television* magazine, the average weekly attendance at motion picture theatres is 0.71. Exclusively radio set owners compile a weekly average of 0.81.

"Taking the results at their face value," the survey concludes, "the indication is that Tv has decreased motion picture attendance only slightly. A decrease of about 13% is shown in the Tv sample as a whole, but this lower average is due, in part, to the large number of 'A' income homes in this sample.

The upper income group goes to the movies less frequently than any other one."

### Summary of Inconclusive Conclusions

The study was undertaken in an attempt to determine Tv's influence upon family habits "after its novelty has worn off." The finding confirmed the fact that important changes do take place in home entertainment habits, but indicate also that "it is unwise to jump to the conclusion that Tv threatens the future of much organized entertainment."

Results showed that night-time radio listening has fallen off sharply, that Tv set owners attend sporting events more than do the owners of radio sets, that magazine reading is higher among Tv owners and that it tends to knit the family unit together more closely when they are at home.

### Juke Box Tv in Jersey Restaurant

G. E. has installed an experimental juke box Tv system in a Hoboken, N. J. luncheonette. "We want to see if John Q. Public will pay five cents to see three minutes of Tv served right in his own booth at a cafe or restaurant," was the G. E. comment.

Wall-mounted sets in booths are operated by a "master control unit" which can handle up to 20 wall sets. Patrons may regulate volume of sound, but the proprietor selects the programs.

### Contribution to Philology

Dr. Lee de Forest, of radio fame, inquires of the editors of *Tele-Tech* whether they have heard the appended definition of a radio engineer. Incidentally, the Dr., while not claiming authorship, states that the item "has a lot of truth in it."

"A Radio Engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulas calculated with micromatic precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopelessly chimerical group of isoteric fanatics referred to altogether too frequently as 'practical radiomen'."

### Kodak Processing Plant in Dallas

Eastman Kodak has started construction on a new wholesale branch and processing station in Dallas, Texas. Intended to lighten the burden on the Chicago office which now serves the Southwest, this new Kodak branch will process 8- and 16-mm motion picture film in both black-and-white and Kodachrome.

## Pulsed-Light Optical Unit for RCA TP-35 B Projector

The pulsed light source employed in the RCA TP-35B projector for Tv provides adequate light output with negligible heating of the film or film gate. In addition, it obviates the need for a mechanical shutter mechanism. The low heating feature of the pulsed light source makes it possible to stop the film and project a single frame as a still. If this

were done with conventional arc lighting, the extreme heat would destroy the film in very short order.

The pulsed light source is provided from a gas-filled discharge tube driven by a pulsing power supply. The power supply is synchronized with the rest of the system by the studio sync generator.

The optical system is adjusted at the

factory so as to require a minimum of field servicing. The TP-35B uses the standard type of optical system used in film projectors. This system consists of a condenser lens system and a projection lens system. With the 6 1/2" focal length lens as furnished, the proper projection distance which gives the correct picture size is 48 3/4" from the film to the mosaic of the TK-20A iconoscope. A micrometer-type adjustment is provided for accurate setting of the projection lens barrel.

FIG. 1. Simplified diagram of picture and sound optical systems, film path, and operation of light pulse. See Fig. 2 for halftone representation of section "A".

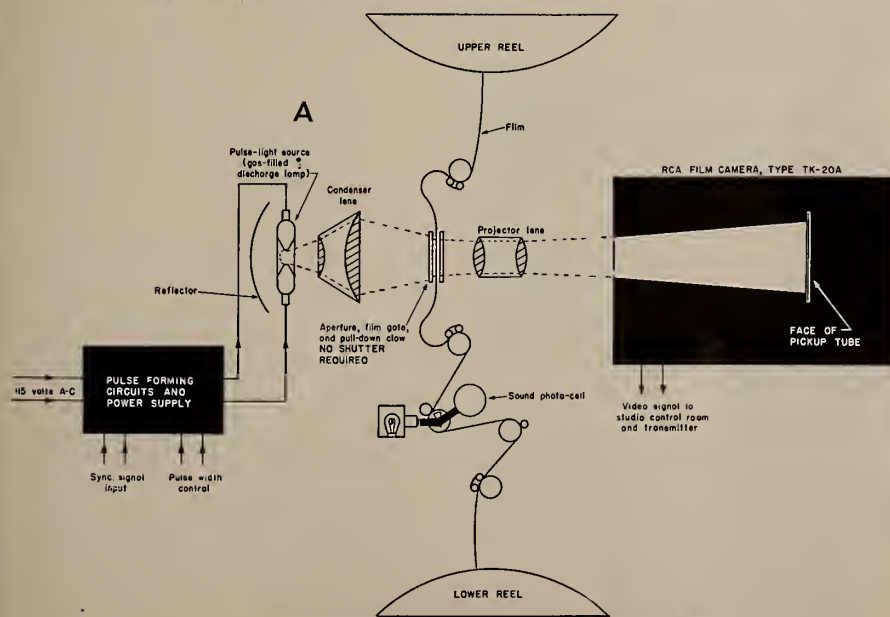
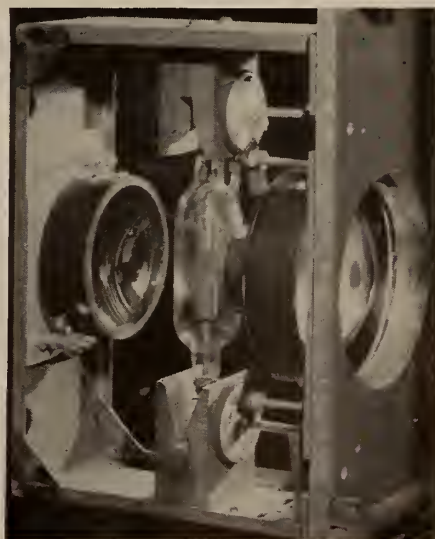


FIG. 2. Halftone representation of section "A" in Fig. 1, showing lamphouse with pulsed-light gap lamp in place.





## LETTERS TO THE EDITOR

To the Editor of *IP*:

Is the sound and action so printed on the film that when the "sound" and "picture" frames on the leaders are placed at their respective positions in the projector, will the sound and action at the speaker mouth and screen be synchronous? This question seems to me to be a basic one in terms of precise projection practice.

Assuming the answer to the foregoing to be in the affirmative, I have always threaded my projectors with a loop about three-quarters of a frame short, so that the sound and the picture would synchronize about 35 feet out into the auditorium. However, I wonder if I am over-correcting?

ARNO WOLD  
Opportunity, Wash.

[The Academy of M.P. Arts & Sciences has by exhaustive tests determined the proper distance between the picture and the sound on the film so as to strike a happy average in most theatres.

Because sound travels so fast, it is doubtful if any time lag would be noticeable within a distance of 100 feet from the screen—that is, if the projector be threaded in accordance with Academy specifications. Beyond 100 feet there is apt to be a noticeable time lag, which, of course, would be normal if any person were talking and another listening at this distance.

Any deviation from Academy threading recommendation will certainly detract from the proper illusion, irrespective of distance from the screen. Projectionists at large drive-in theatres might have something interesting to contribute on this topic.—Ed.]

To the Editor of *IP*:

We want to express our hearty thanks for the fine article relative to rounded screen corners in your May issue.<sup>1</sup> We are using rounded screen corners now and we can say that they encompass every advantage claimed for them by Mr. Mitchell.

LESTER A. WEISS  
Capitol Theatre, Kalamazoo, Mich.

To the Editor of *IP*:

For the edification of the boys, I append hereto a clipping from the technical (?) section of a recent issue of an exhibitor paper:

### Patching Trucolor Film

My idea on patching Trucolor film is to put strips of Scotch tape on *both* sides of the film. A patch made this way is guaranteed to hold, especially with safety film. I find it never fails.—R. J. JONES, Mt. Holly Springs, Pa.

I may add that since this item was

<sup>1</sup>"Psychological Elements in Projection," by Robert A. Mitchell; *IP* for May, 1949, p. 14.

printed "bare" without editorial comment, the procedure outlined is approved by the publication in question.

RAY MCALLISTER  
Los Angeles, Calif.

[The use of Scotch tape as a splicing agent gives rise to unlimited possibilities for headaches, in addition to inviting serious damage to the projector. It requires no great degree of imagination to realize what would happen

should the tape turn up an edge and start to roll back.

Such procedure is the worst possible projection technique, and it is unfortunate that widespread publicity was given such a stunt without a word of critical comment.

Distributed by Republic Pictures exchanges, Trucolor stock (like Magnacolor, Cinecolor, etc.) is what is termed a *duplicated* film in that it has emulsion on *both* front and back surfaces. This fact occasions a bit more difficulty in splicing than does the same chore on single-emulsion safety or nitrate film.

On all duplicated stock, including Tru-

(Continued on page 26)

## New Century Soundfilm Systems Reflect Latest Advances

**C**ENTURY PROJECTOR CORP. has announced a new line of soundfilm reproducing systems, adaptable for every situation from the largest to the smallest. The line is featured by unique switching panels and extreme accessibility in getting at even the smallest system unit.

Figure 1 (left) shows a complete dual channel system (40 + 40—80-watt) including main amplifiers, power amplifiers, exciter lamp power, and preamplifier power supply. In terms of utmost flexibility and 100% protection under any and all conditions, this system represents the best available equipment in the field.

The top group of three panels (Fig. 1) includes two main amplifiers (W5-17) and a switching panel (W5-170). On the middle panel are two power amplifiers (W5-16—80 watts) and a power amplifier switching panel (W5-180). On the bottom panel are two exciter lamp power supplies (W5-15, d-c) and an exciter lamp power supply switching panel (W5-160).

A W5-180A power amplifier switching panel may be substituted for the W5-180

panel when using 250-500 watt power amplifiers; and the W5-140 exciter lamp power supply may be used in place of the W5-15 d-c power supply.

Every projectionist knows the futility of trying to trace a "floating" connection which disappears when a cable or wire is moved. In this new Century design every wire and cable remains fixed in position at all times, which permanency is a real advantage. Anybody can easily trace all Century circuits, even without a blueprint, and can test every circuit for continuity.

Figure 2 (right) shows the three switching panels in a closer view. At the top is the main amplifier switching panel (W5-170), with two switch positions. Position No. 1 connects the main amplifier No. 1 into the power circuit, together with all power circuits to the preamplifiers, photocells, etc. Position No. 2 connects main amplifier No. 2 into the circuit.

A signal light is above each switch position—one green, the other red—which easily identify the amplifier being used. The main amplifier switching panel is also used for the 15-watt main amplifiers (W3-11).

In the middle is the power amplifier switching panel (W5-180), having four positions with signal lights to indicate the combination being used. Position 1 connects the main amplifiers directly to the stage loudspeakers or drive-in speakers, thus cutting out the power amplifiers entirely. In this position both signal lights are out.

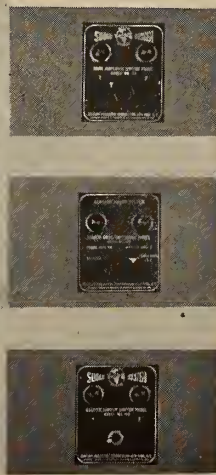
Position 2 connects power amplifier 1 into the circuit, whereupon signal light 1 is "on" and shows green. Position 3 connects the power amplifier 2 into the circuit, with signal light 2 "on" and showing red. Position 4 connects both power amplifiers 1 and 2 into the circuit, with both signals being lighted.

At the bottom is the exciter lamp supply switching panel, with two switch positions. Position 1 connects power supply 1 to the lamps; and similarly with position 2. In each position the corresponding signal is lighted, indicating by green and by red which power supply is being used. As stated, either a-c or d-c exciter lamp power may be thus controlled.



FIG. 1 (left).

FIG. 2 (below).



Components of new Century sound system, including (Fig. 1) complete dual channel system and (Fig. 2) the three switching panels.

## THE GREAT ENIGMA: THE STEREOSCOPIC PERSPECTIVE

(Continued from page 15)

background, the pencil is seen twice and, as it were, in a transparent manner. In normal vision we manage to nullify this effect by the simple expedient of ignoring it.

These facts anent the double-imaging of objects in stereoscopic or binocular vision are highly important in terms of applying the stereoscopic perspective to photography, in which case the double image would be disastrous.

The perspective which has all the characteristics of the stereoscopic perspective, with the exception of the aforementioned double image, is that for which the writer has devised the name "trimensional perspective."

### Stereoscope Retards Progress

The writer feels that in deriving the properties and characteristics of the stereoscopic perspective, no less than in reducing it to definite terms, he has proven conclusively that Helmholtz was completely right when he postulated its existence. Had Helmholtz lived to see motion pictures, and particularly a film produced by a transversely moving camera, his belief in the existence of the stereoscopic perspective would have become a certainty.

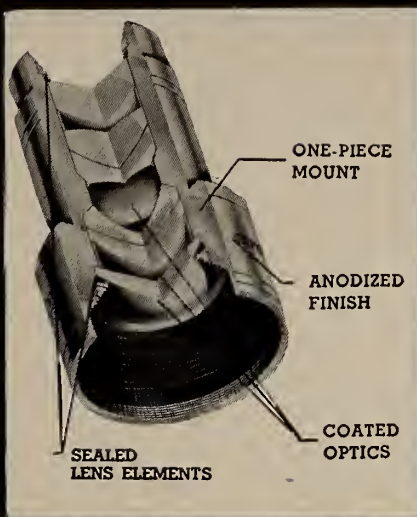
The bald fact is that the advent of the stereoscope, while a brilliant invention, served only to confuse investigators and thus barred the road to further progress and a true insight into the stereoscopic perspective. It gave rise to the universally accepted fable that there existed in the brain an enigma which could not be solved with the means available to science, and which might very well be beyond the powers of the human mind to comprehend.

The solution to this enigma was hidden in the mysterious convolutions of the *cortica*, which alone possessed the power to merge two visual images. This cortical-merged image, which defied measurement and thus any systematic analysis, is held by the writer to have been proven herein to be completely accessible to the mind and subject to precise definition.

### There is No Enigma

Once scientific workers possess the facts relating to binocular or stereoscopic vision (namely the creation of a specific, definable and calculable perspective which obeys laws as rigid as those governing the geometric perspective), it becomes a simple matter to produce optical aggregates which will produce single images with all the attributes of stereoscopic vision. In fact, the writer many years ago constructed such apparatus,

## f/1.9 SUPER-SNAPLITE



Question Box

No. 7

### ARE THE LENS ELEMENTS COATED?

Yes, all glass-to-air surfaces (all surfaces except the cemented ones) are coated with a thin film of hard magnesium fluoride on Snaplite Series II and Super-Snaplite lenses.

### JUST WHAT DOES THIS COATING DO?

The coating decreases internal reflections and increases light transmission at each surface. By practically eliminating stray light, it improves contrast, brings out colors more fully, and increases the brightness of the picture.

### HOW MUCH BRIGHTER DOES THE LENS COATING MAKE THE PICTURE?

The coating increases light transmission about 4% per lens surface. Thus the Super-Snaplite having 8 coated glass-to-air surfaces transmits about 30% more light than would a similar lens with uncoated elements.

### WHAT CAUSES COATED LENSES TO BECOME CLOUDY?

The magnesium fluoride coating does not cause cloudiness, but might, because of its purple-straw color, make the cloudiness more apparent. Under the same conditions uncoated lenses will also have the deposit.

### WHAT IS THE DEPOSIT THAT FORMS ON LENS SURFACES?



This deposit may be dust, fumes from lamp housing or oil. Poor ventilation of the projector or projection room will probably cause a deposit to form on any glass surface in the projector or projection room.

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which gave promise of achieving the desired results.

Whenever such an aggregate was handed to an optical calculator, the desired effects promptly disappeared. The aggregate became capable of producing the undistorted, geometric perspective, because the calculator knew that only this "perfect" perspective must be the aim of his work.

In the motion picture field, several attempts have been made to produce stereoscopic effects by means of distortions applied to the individual pictures, either during the taking or in the projection process. Considering the data contained in this article, it is obvious that no amount of distortion in a geometrically correct picture will ever produce the stereoscopic perspective.

Several attempts have been made to project real images standing in the air in front of concave mirror arrangements, notably by Dr. Kogel in Germany, who used a mosaic of concave mirrors with quite some success.

#### **Stereo Merging-in-Time**

It is pertinent to mention the attempts to create stereo effects by means of projecting alternating stereo pairs. High hopes were held for this process because of the striking stereo effects experienced when viewing a film made by a transversely-moving camera. Helmholtz would have immediately recognized the true significance of this phenomena.

Such films serve to discredit the erroneous concept that *spatial vision* may be attained only if each eye sees only its proper image, and that two paraxially different images must be seen separately by two eyes in order to be merged in the brain.

These films consist of a series of pictures each one of which, together with the previous or the following one, forms a stereo pair. When projected, these images are seen in succession. Often the effect is startlingly real and truly stereoscopic, as one observes depth and solidity and looks at space rather than a flat screen. Yet, this succession of stereo pictures, as such films really are, is always seen simultaneously with both eyes (or by one-eyed people with a single eye) so that the mysterious merging power of the brain seems to work for images in succession just as well as for separate stereo images seen with different eyes.

#### **How Images Merge in Time**

The reason for this merging process in time lies, of course, in persistence of vision whereby we see the image which just left the screen and the one being projected. As both foveas are always directed at the same center of momentary interest, complete merging of the parts of the picture adjacent to such centers of interest becomes quite easy, again be-

cause these are seen only with great haziness anyway, so that no greater confusion need be felt if two separate pictures are mixed around the center of interest.

If, now, alternate pictures taken from the right and left are projected, the stereo sensation arises in the same manner but is accompanied by a rapidly rising feeling of fatigue, because the eyes are compelled to center the two foveas on an oscillating center of interest. This represents a definite hardship, of course, and moreover creates the impression of excessive flicker.

### New Photographic Aggregates

Photographic aggregates, as stated previously, can be made which produce single images with all the attributes of stereoscopic vision and which the writer termed "trimensional images." Pictures made with such an aggregate, whether seen with both eyes or a single eye, convey an impression of depth, solidity and space.

Pictures made with trimensional aggregates may be printed on ordinary paper or projected with conventional projection apparatus. No special films, screens, analyzers nor any special viewing devices or separators are required for viewing, whether by one-eye or two-eyed people.

Repeatedly the opinion has been voiced that if we possessed four eyes positioned, for instance, in a diamond shape, we would be able to see stereoscopically "all around" and the result would be a more acute perception of depth. This point is important, because the optical trade would be able to make aggregates with this "quadrocular" perspective just as easily and certainly with greater accuracy than they could make aggregates with the binocular perspective.

We know it to be a fact that if we hold our head sideways, we perceive stereoscopy in the *vertical* sense. Nature ignored the opportunity to endow us with this, possibly superior, stereo vision, thus we must live our lives out as binocular bipeds. It is doubtful whether the easily attained quadrocular perspective would be any real improvement.

### Quadrocular Perspective?

The perception of depth, solidity and space, the writer opines, is an *acquired*, *experiential* faculty. One-eyed people develop this faculty in a different manner, but it remains an *acquired* faculty. We are a binocular people, by a wide majority, and that's that.

Analysis of the perspective we perceive shows that horizontally we see objects narrowed down and interspaces widened. Further, we noted that ratios of width to height change with distance, and

this change is part of the fund of experience utilized in our acquired perceptions of depth and distance. The writer feels that this measuring rod, subconsciously applied, must be an important part of our mental visual armamentum.

This interpretation of changing ratios between width and height, however, would be totally lacking in the quadrocular perspective, as can be easily proven by an analysis similar to that applied to the binocular or trimensional perspective.

At best, it's a moot question just what kind of perspective should be adopted for photographic purposes, with the final judgment doubtless reposing with the general public after having viewed one or the other kind of perspective.

### The Perspective of Tomorrow

Trimensional pictures, the writer is certain, will replace the present geometric pictures as a matter of course. The trimensional perspective will lend a touch of amazing reality to photographs and reproductions of any and all kinds whatsoever. The effects will be retained in the halftone process, will be universally used in illustrated magazines, and add immeasurably to the enjoyment of all pictorial work.

In motion pictures the trimensional perspective will add the final needed

touch of reality, particularly if a good color process is employed in making the films. As this perspective depends only on the optical characteristics of the aggregate used as a camera objective, there would need be no difference in treatment as between black-and-white and colored film.

### Geometric Perspective Inadequate

There is even a chance that artists may familiarize themselves with the laws of trimensional perspective, and that these laws will be taught in the art schools which now concentrate on teaching the laws of geometric perspective.

While recognizing the importance in an historical sense of the geometric perspective, the writer hopes fervently that it will be abandoned, because while it is "undistorted" it certainly is totally inadequate in our age of great scientific development.

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## LETTERS TO THE EDITOR

(Continued from page 22)

color, the emulsion on both surfaces must be scraped, and the removal of the sub-base is a bit more critical than on other safety film or on nitrate stock. Explicit step-by-step instructions for the splicing of duplitzed stock has been given in these columns on several occasions recently, notably in the first inclusive article anent safety film ever published in the industry press.<sup>1</sup> The splic-

<sup>1</sup> "Safety Film: Projection Factors," by Henry B. Sellwood; IP for Nov. 1948, p. 9.

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ing of not only Trucolor but of *all* types of film should offer not one whit of trouble to the experienced projectionist who follows the procedure outlined in the aforementioned article.

Oddly enough, for several years prior to 1948 Trucolor had virtually a corner on the available supply of acetate film (not to mention the various releases on safety stock by the Government during the war) and projectionists accomplished the splicing operation in routine fashion.

Unfortunate it is that circulation is given such nonsense by exhibitor papers, but since neither the contributors of such stuff nor the exhibitors who may read it apparently know from nothing about the projection process—and probably care less—the damage done is probably minuscule.—Ed.]

*To the Editor of IP:*

The table of conversion factors for both illumination and brightness units appearing in the June 1949 issue of IP\* has been very worthwhile, and I am sure that those of us who delve into the foreign technical publications and thus encounter some of the European units will find it most helpful.

There is, however, one error in the "Brightness" table. The third line in this heading should read:

"1 apostilb (German Hefner) =  
0.09 millilambert"

instead of 0.9, as you present it. There is only a slight difference between the international apostilb and the German version; whereas the figures in the table published in IP make it appear that there is a 9-to-1 ratio.

This error was also brought to my attention by one of the lighting technicians of the Bureau of Standards.

RALPH E. FARNUM  
Engineering Div., General Electric Co.  
Nela Park, Cleveland, Ohio.

[Being apprised of the source of the data

\* "Stillb" and Other Irritants Reduced to Americanese," p. 12.

which appeared in IP, Mr. Farnham, an old friend and co-worker in the projection vineyard, weighed-in with the appended enlightening commentary.—Ed.]

The fact that you took the conversion factors for lighting units from the Illuminating Engineering Society Lighting Handbook† certainly absolves you from blame, but it does reveal the very interesting fact that the Handbook is wrong. On page 38 of the latest edition of Illuminating Engineering Nomenclature and Photometric Standards, which has the approval of the American Standards Association (ASA Z7.1-1942) you will note that the figure of 0.09 millilambert equals 1 apostilb in German units.

*'Too Close to the Forest . . .'*

Your use of the I.E.S. Handbook for the conversion table in IP for June is a good joke on me, incidentally, because although I was responsible for writing Section 14 of the Handbook, I didn't realize that the material you cited was in the book.

I am glad that this pleasant exchange of correspondence proves that we and many other lighting engineers do read IP, and closely too.

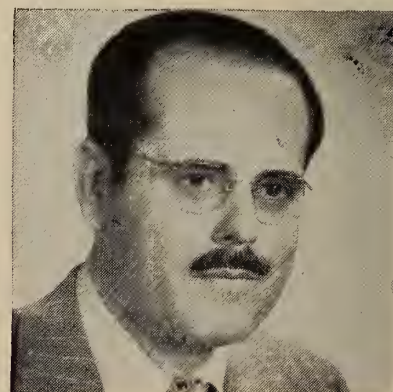
RALPH E. FARNUM

*To the Editor of IP:*

Why must M-G-M perforate their initials on all splices that are made in their exchanges? When the film is cupped to check whether the splice is tight, it will almost always break at the perforations.

In the case of the sample enclosed here three frames were lost in order to make a new splice. Quite a few exchanges do

† 1947 Edition, Appendix A-35, Table A-17: "Conversion Factors for Lighting Units."



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not remove the film binder when making splices.

ROY L. SHENK  
Meyerstown, Penna.

[Replying to the foregoing, M. D. O'Brien, assistant director of projection and sound for Loew's Theatres, offers the following]

"I have examined the Metro splice submitted. It has been the custom of Metro for many years to use an embossing stamp on all splices made in their exchanges. This stamp *does not* perforate the film and it cannot be seen on the screen.

"The deficiency of the sample splice obviously is not occasioned by the embossing stamp but by an inferior patch caused by poor cement or, in this case, possibly by the

fact that the film had been on an extended run and the splice had dried out.

"The practice of embossing splices has met with a great deal of favor because it serves as conclusive proof that the exchange has properly examined the print, an important assurance to the projectionist."]

To the Editor of IP:

My own working experience in all kinds of projection rooms and with all kinds of equipment—good, bad and indifferent—convinces me that the advice given in your article "Safety Film: Projection Factors"<sup>1</sup> is absolutely sound and trustworthy in all particulars. I am

<sup>1</sup> IP for November 1948, p. 9.

happy to see that the article still is being referred to, even if by miffed splicer manufacturers.<sup>2</sup>

I have used Griswold splicers both new and considerably used. In fact, some of them have been so worn that I have had to resort to hand splicing to avoid film breaks. Frequently I have found it necessary to dismantle the splicers, have the parts re-machined, and put them together again, making all adjustments more or less by trial and error in order to restore them to serviceable condition. The best of film cements are worthless in the face of crudely designed splicing machines.

I have also found that the shear bar of the Griswold splicer quickly becomes rounded at the edges through daily use, resulting in splices which are weakest at their most critical points—the edges of the stubs. The "doctoring" of splices made on used Griswold splicers by brushing in a little extra cement at the edges and ends of each splice and pressing the ends of the splice with my fingers has now become almost habitual.

Perhaps it is a good thing that the vaunted Griswold guarantee does not extend beyond one year.

#### Projectionist Competency Defended

It is strange that Griswold should consider projectionists incompetent to make *adjustments* on their simple splicing device. Most projectionists are capable of servicing projectors, machines considerably more complicated than splicers.

The pressure spring, or clamp, is another weak feature of the Griswold, and one that requires adjustment from time to time. This might not be necessary if a flat pressure bar of considerable width were substituted for it. Furthermore, the pressure is not nearly great enough. Let Griswold improve their product or else furnish projectionists with aligning tools and instructions for making the needed adjustments.

What we really need is a new and completely automatic splicing machine, even to the application of the film cement. Scraping should be accomplished by a motorized grinding, or abrading, device. Scraping on the Griswold is a headache. Personally, I have my own scraper—an old pair of scissors I have filed off for this purpose. Sounds crude? Well, Griswold's scraper isn't good enough for me; and my old pair of scissors has managed to see me through a decade without a single film break.

ROBERT A. MITCHELL

<sup>2</sup> "Letters to the Editor"; IP for June 1949, p. 17.

#### What is a Projector? ASA Version

A Projector is a device which concentrates luminous flux within a small angle from a single axis.\*

\* Definition adopted by American Standards Association, February 27, 1942.

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## Joint TESMA-TEDPA Convention at Chicago, Sept. 26

"It's later than you think," warns Roy Boomer, in issuing a final appeal to all interested parties to complete arrangements for participation in the forthcoming TESMA-TEDPA (manufacturers and dealers) convention to be held at the Stevens Hotel, Chicago, beginning September 26. Although there are very few exhibition booths left for this meeting, Boomer advises that extraordinary effort



**ROY BOOMER**  
Executive secretary of manufacturers' association urges prompt action on TESMA-TEDPA convention arrangements.

will be made to accommodate every manufacturer who wishes to show his wares. Also, hotel room reservations should be made immediately.

A feature of the convention will be an open forum at which will be discussed the probable impact of television upon the motion picture theatre, with comment solicited from those reflecting every shade of opinion. Attendance at this session is expected to exceed 2500. Both TESMA and TEDPA will elect officers and board members at this meeting.

### First Audio Fair in N. Y. Oct. 27-29

The nation's first Audio Fair is to be sponsored by the Audio Engineering Society at the Hotel New Yorker, N. Y. City, Oct. 27-29 inclusive. Rooms and suites comprising the entire sixth floor of the hotel have been reserved for exhibitors.

The exhibits and the technical sessions to be held each day of the meeting will cover recording and reproduction on tape, disc and film, in addition to microphones, loudspeakers and amplifying equipment. No fee will be charged anyone attending the exhibits.

### New Canadian Equipment Ban Seen

American equipment manufacturers and distributors are fearful that the intensified austerity program recently charted by the British government for the next two years at least, in which the dominions have promised support, will

result in the reimposition of restrictions on the importation of movie equipment into Canada.

Similar restrictions imposed by Canada in 1947 have been gradually eased since last December, but exporters expect the worst when Parliament convenes in September.

### G. P. E. Tops '48 Sales, Earnings

Consolidated net income of General Precision Equipment Corp. and subsidiary companies for the three months ended June 30 was \$317,756, equal to 53 cents per share on the outstanding common stock. This compares with consolidated net income of \$297,952 for the same period in 1948, or 50 cents per common share.

Net sales for the second quarter of 1949 totaled \$7,505,491 compared with \$6,721,103 for the similar period of 1948.

### Biggest Film Producer in the World?

Who is the biggest producer of motion pictures in terms of footage in the world? The U. S. Army Signal Corps Photographic Center at Long Island City, N.Y., which now tops the production of any Hollywood studio with more than 4 million feet of film a month—1½ million feet of 55-mm negative and 2½ million feet of prints.

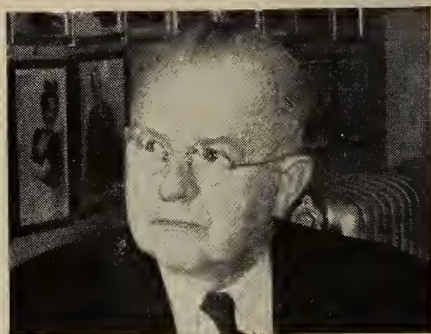
A recent typical week saw the Center with 233 productions in work: 60 scripting, 55 in work, and the remainder in scenario or finished print form awaiting clearance.

### New Inkie Lamp-Basing Cement

The development of a new lamp-basing cement for use with lamps operated at high temperatures, where previously it was neces-

sary to use so-called "mechanical" bases, is announced by Westinghouse (Bloomfield, N.J.). In some types of lamps, replacement of the mechanical base with a conventional base in combination with the new cement definitely improves the construction of the lamp and better overall performance.

Exhaustive tests of the cement show that it will not deteriorate when subjected to temperatures as high as 446°F. This new development is an important contribution to the art, especially when operating lamps in smaller equipments and at ever-increasing temperatures.



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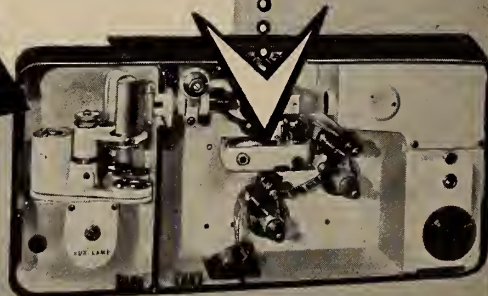
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## PERSONAL NOTES

BERT SANFORD, for the past 20 years sales manager for Altec Service Corp., has been named sales director for the ABC Vending Corp., which has extensive theatre franchises for candy and refreshments.

Sanford, an industry veteran, began his career as an actor for D. W. Griffith, and later entered the exchange field. He joined ERPI, predecessor of Altec, in 1929 and has been active in the sound equipment and service field since that time. He will continue to serve Altec in an advisory capacity.

MARTY WOLF has been named to the Altec sales post vacated by Sanford.

CHARLES M. ODORIZZI has been appointed vice-president in charge of servicing operations of the Victor Division of RCA. He was formerly general manager of the Mail Order Division of Montgomery Ward & Co.

DR. LOYD A. JONES, of Kodak Research Labs, has been elected an honorary fellow of the British Photographic Society. This election, considered a signal honor, is the

third recognition of Dr. Jones this year by the Society: in February he was awarded the 1948 Progress Medal, and in May he lectured before the Society and won the Hurter and Driffield Medal.

### New Self-Operative Soldering Iron

Requiring no electric current or external heat of any kind, a new type of soldering iron utilizes a chemical cartridge that heats the iron to working temperature in 5 seconds and maintains heat for 6 to 8 minutes, depending on the type of work done. The cartridge, which is about the size of a small flashlight battery, contains a primer and is ignited in a manner similar to that of firing a bullet.

After the cartridge has been placed in the copper tip of the iron, it is set off by the impact of a spring rod which is pulled out and released at the back of the handle. The pointed end of the rod strikes the primer that generates the heating action, which is created by the chemical mixture of metal powders similar to magnesium and an oxidizing agent.

The heat developed is about 250 watts peak, hence the iron can be used on heavy as well as light soldering jobs. A new cartridge is required each time the iron is used. By the Kemode Mfg. Co., N. Y.

### ORIGINS OF 'MAGIC LANTERN'

(Continued from page 19)

thus is *not* the inventor as is often supposed, deserves, however, the merit of having popularized it in his famous book "Magica Naturalis" (first edition 1558, second edition 1589 in Naples), a curious mixture of science and charlatantry. The result was a wide application of the camera obscura, which in those days indeed had the dimensions of a "camera" (room, see Fig. 2) as a contrivance for performances of various character.

#### Porta's Contrivance for 'Pictures'

In one of the walls a simple spectacle lens was placed and a hollow mirror was used to reflect the images of the objects outside the room in this lens: the pictures were thus projected on the screen,

the opposite wall, right side up. As in the modern theatre, the spectators sat facing this screen with their backs to the lens, which was more or less hidden, making the performance a rather mysterious affair.

On an open space in full sunlight outside the "camera" and before the lens the different scenes were played. For instance, hunting parties were very popular in which the game was represented by disguised boys or wooden effigies. War scenes and passion plays were also presented. At night statues and large

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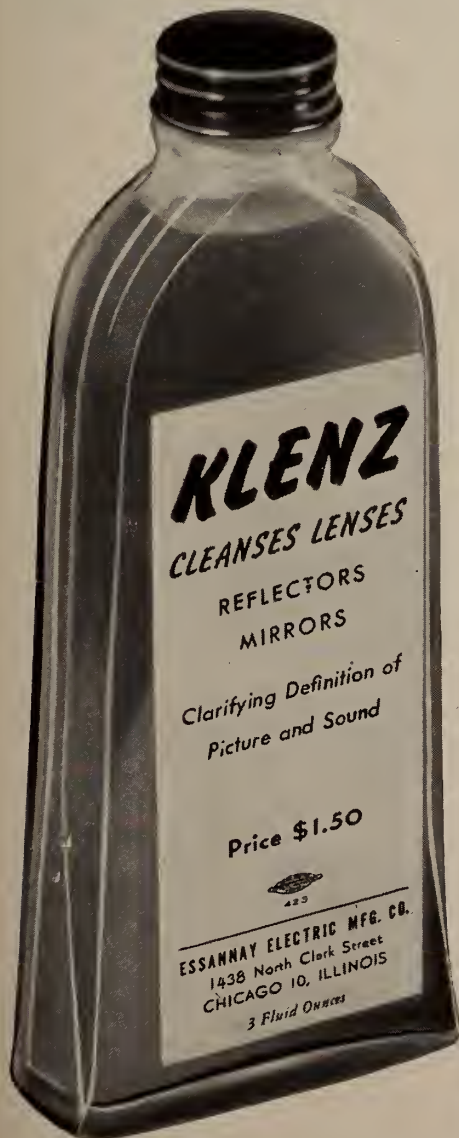
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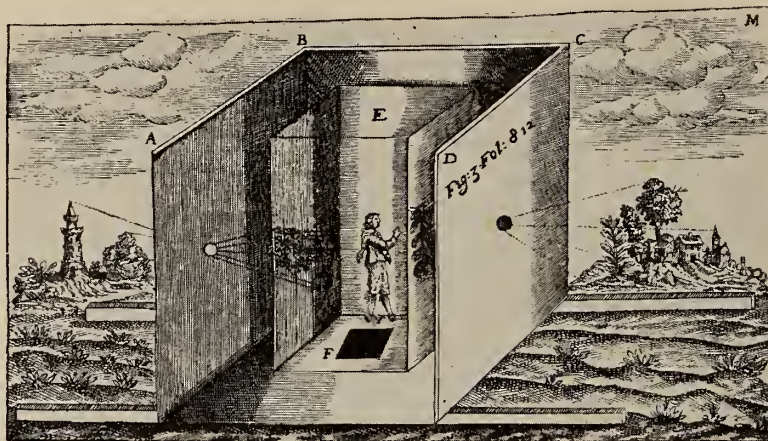


FIG. 2. The camera obscura in the sixteenth and seventeenth centuries.

pictures painted on canvas lighted by torches were shown.

In this way the public saw pictures of the emperor, scenes of the rising and setting of the moon and stars, and last but not least images of the devil to frighten the spectators who still looked upon the whole performance as an uncanny and supernatural affair. It must be noted that in its *application* the camera obscura came quite near the performances which were given with the "laterna magica" some 70 years later.

#### Priestley's Erroneous Conception

When, in addition, the well-known English chemist Priestley (1733-1804) in his work on the history of optics (1776) wrote that Porta also used transparent drawings as "slides," the close connection between the projecting lantern and the camera obscura seemed to be certain, and for a long time it was held that the former developed out of the latter.

As has already been mentioned, a careful study of the available old literature shows that another development is more probable. In Priestley's description, Porta is said to have traced drawings on transparent paper attached to one of the sides of a hollow cube the opposite side of which was open and turned to the lens. From this transparent drawing, placed outside of the room, an enlarged picture was formed on the screen. The necessary light came from the sun. By making the slide movable, Porta is said to have been able to attain effects which seemed positively uncanny to his contemporaries.

Priestley further supposed that the German Jesuit, Athanasius Kircher, following up on Porta's device, later invented the magic lantern (Fig. 1) which did the job of the camera obscura at night. Thus Priestley refers to the "Magia Universalis" (1657) a work of Kaspar Schott, an assistant of Kircher. But, in turn, Schott refers to the *first* edition of Kircher's "Ars Magna Lucis et

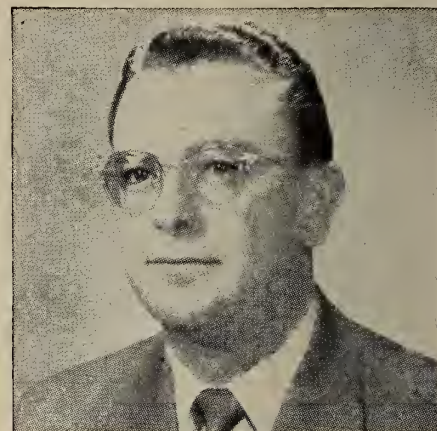
Umbræ" of 1646 in which the camera obscura was described, and after an explanation of the apparatus Schott wrote ("Magia Universalis," volume 1, page 198, Wurzburg 1657):

"In order that the spectator does not notice the small hole with the lens so that the effect is more mysterious, one attaches inside the room in front of the lens a hollow cardboard cube with blackened sides, except the side turned to the lens, which is open, and the opposite side, which is made of transparent paper. On this transparent paper one projects the image of cardboard objects placed outside the room which are turned upside down in order to get the pictures right side up on the screen. . . ."

Priestley thus made the mistake of

supposing the cube to be attached *outside* the room and of supposing the screen to be a "slide" for the drawings. Second, Porta was accredited with the technique, which, however, was developed long after Porta by Kircher, to whom Schott refers. Owing to the authority of Priestley, his mistake was repeated in the historical works of Joh. Carl Fischer and Poggendorff, and from these in the more modern books.

[To be Continued]



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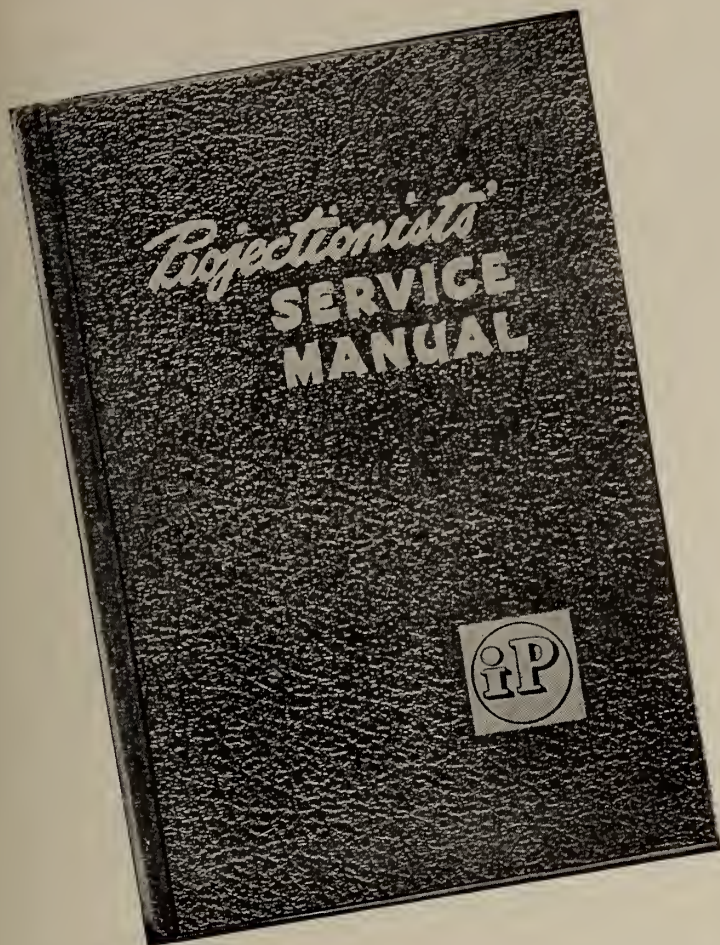
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WAS FIRST WITH  
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GEARS?

**6** WHICH PROJECTOR  
WAS FIRST WITH  
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FIRE  
TRIP?

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WAS FIRST WITH  
HARDENED  
AND GROUND  
SPROCKETS?

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WAS FIRST WITH  
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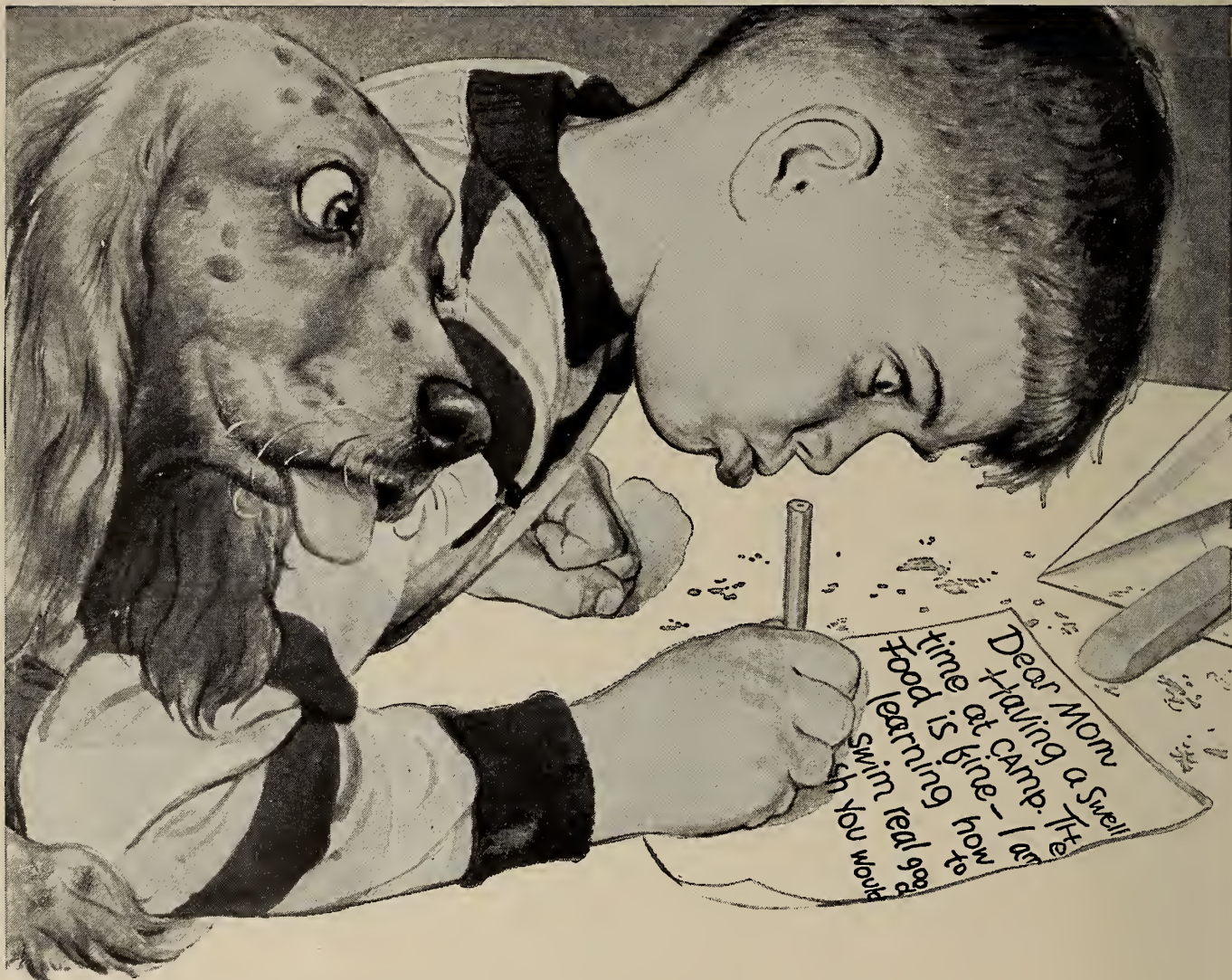
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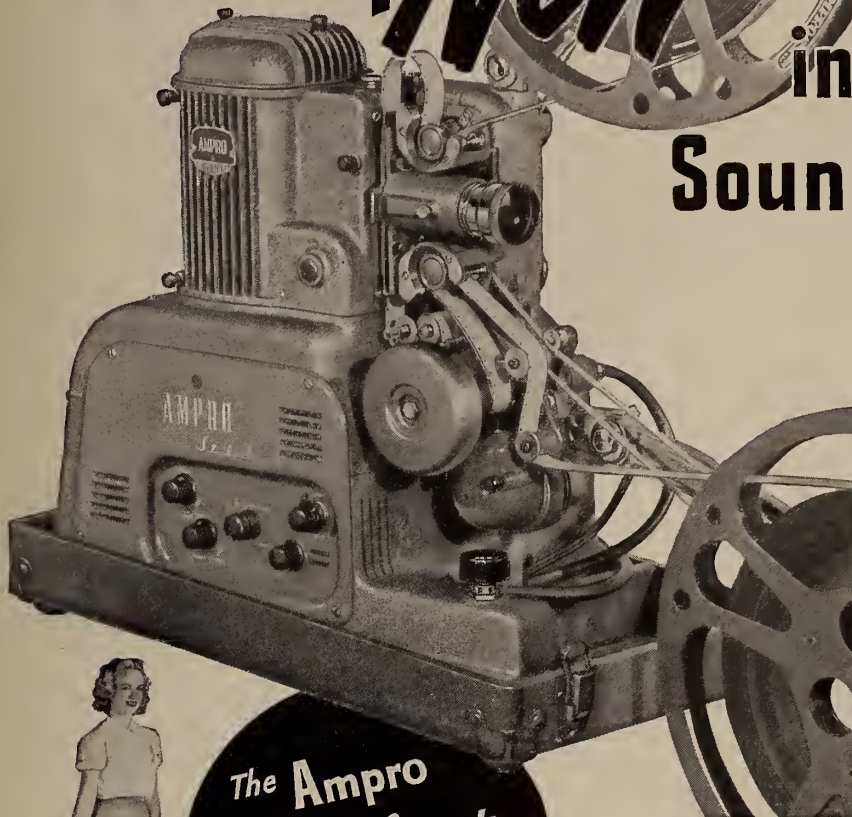
So don't let your life run on like Buzzie's handwriting. Fix up the "end of the line" once and for all by signing up today for the Payroll Savings Plan—or, if you are not on a payroll, the Bond-A-Month Plan at your bank.

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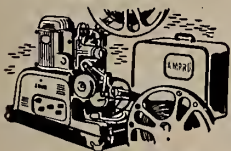


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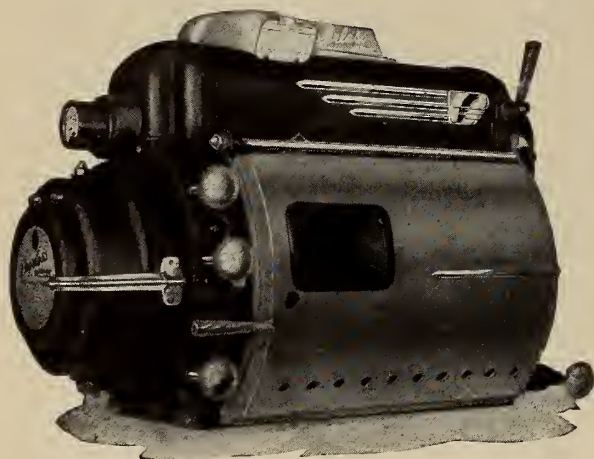
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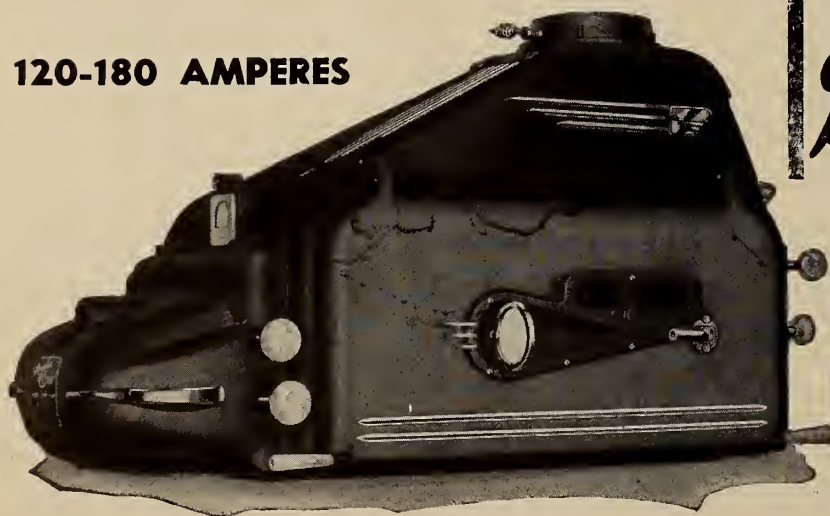


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HENRY B. SELLWOOD, *Editor*

Volume 24

SEPTEMBER 1949

Number 9

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## MONTHLY CHAT

IT WAS observed in this corner recently that there was developing a definite trend toward a much closer co-operation between, on one hand, manufacturers and projectionists—seller and user—and, on the other, between the manufacturers themselves. This growing recognition of the strong mutuality of interest which exists between both groups is one of the most encouraging developments in recent years.

No more tangible evidence of this new spirit in the field is needed than the symposium on cooling methods for high-intensity arc projection which appears elsewhere in this issue and which reflects their views of top-flight equipment manufacturers on this pressing problem.

IP solicits the serious consideration by its readers of this symposium, for two reasons: that they may be better informed about the projection process, and in the hope that, drawing upon their day-to-day practical operating experience, they may be able to make a significant contribution to the solving of this problem.

Ironically, the manufacturers now find themselves hoist on their own petard in that by striving assiduously and successfully to meet the demands of the field for more light, they now are being devilled by the end product of their ingenuity and progressiveness. It may be asked what the film manufacturers, whose product forms the very core of this problem, are doing about the matter. This group is working feverishly to come up with the answer—as attested to by their many contributions to the literature thereon—but unfortunately even their vast scientific resources have not yet been productive of a means for making film heat-resistant the while it retains its full pictorial quality.

Not often, if ever, have manufacturers of competitive projection products been willing to take down their hair, so to speak, and set forth in print their views on a controversial question of this nature, and this, to us, is indicative of the seriousness of this problem.

IP's suggestion that the SMPE sponsor a forum in which manufacturers and prominent projectionists air their views on this topic is militated against by two factors: first, time is of the essence in this matter, and such a get-together would necessarily require restrictions in the matter of attendance. Obviously, the SMPE could not satisfy either of these requirements.

IP stands ready to sponsor such a forum "on the house" in terms of making all arrangements such as providing a suitable meeting, transcribing the record of the proceedings, etc. Three manufacturers have already indicated their willingness to participate in such a forum. All we need is a nod from the others to start the ball rolling. We'll do the rest.



## She keeps the romance running smoothly...

THE spell of this picture's song and story might suddenly be broken . . . but for film row's "first lady," the exchange inspectress.

With unrelenting vigilance, she has inspected every inch of film before each booking...checked it for worn perforations, torn splices, and other signs of wear and tear that might hinder smooth projection and mar the enchantment of

the show. By this painstaking care of film and unceasing effort to keep each reel running smoothly, the inspectress has earned a place of importance behind the scenes of motion picture distribution.

And her work is all the more easily done for the quality and reliability she finds in the release prints made on Eastman film.

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# Lens and Film Factors Affecting Focus

OVER and above the special problems peculiar to the projection of colored pictures, certain other focusing difficulties are common to prints of all types. These are (1) poor photographic image, (2) image flutter, and (3) focus drift. Little need be said about out-of-focus pictures on the film; the projectionist can do nothing to improve their appearance on the screen. The distributor, ever evading responsibility, would like to have us believe that the condition is also beyond his control; so it avails little to complain about a poor print when the fault lies with either the camera crew or the processing laboratory.

*Image flutter* is a rapid in-and-out-of-focus effect caused by buckled and warped film. In rare instances frame-embossed film gives a somewhat similar fluttery image.

Buckling is caused by the heat to which the film is subjected in the projector. Heat shrinks film, and if the heating were uniform, the consequent shrinkage would be uniform. But in passing through the projector gate the perforation margins absorb more heat than the picture part of the film because of their prolonged contact with the hot gate shoes, or runners.

The picture portion receives only a momentary flash of radiant heat (infrared), and much of this passes through the film with the visible light instead of being absorbed. As a result, the edges undergo greater shrinkage than any other part of the film. The picture portion is thus buckled out of shape so that it flops in and out of focus during projection.

Nitrate (inflammable) film is much more susceptible to the deleterious effects of heat than the more stable high-acetyl acetate (safety) film. Severe buckling

By ROBERT A. MITCHELL

II

and film shrinkage should be relatively rare with the new high-acetyl safety film.

The projectionist should not attempt to recondition full-length reels of buckled film. However, short rolls of buckled film—announcement and advertising trailers, for example—may easily be treated in the projection room with more or less success.

A buckled *acetate* film should be wound in a roll having the clear, or base, side of the film facing out. The roll is then placed in a film can, the cover of which is fitted with a blotter *lightly* moistened with water containing glycerine to prevent drying out (1 teaspoonful of glycerine to half a pint of water). The box is closed tightly and left undisturbed for a week. If at the end of that time traces of buckling remain, the treatment should be repeated.

A buckled *nitrate* film should be wound with the glossy clear side of the film facing out. The roll is placed in a film box having a cover which is fitted with a blotter heavily charged with camphor and also lightly moistened.

Dissolve a small cake of camphor in an ounce or two of acetone. Wet the blotter thoroughly with this solution. When the acetone has completely evaporated, the fibers of the blotting paper will be impregnated with the camphor. The dry camphorated blotter may then be lightly sprinkled with the water-glycerine mixture used for safety film. The box is tightly closed and left undisturbed for a week or more.

Unfortunately, there is no way to over-

come the image flutter of buckled film during projection. Increased gate tension fails to relieve the trouble.

The annoying and insidious phenomenon known as *focus drift* is more common than is generally supposed. Prints having focus-drift characteristics require changes in focus during projection. *Progressive* focus drift is characterized by a practically constant shift of required focus. If a reel having this fault be focused sharply at the beginning, *the lens not being subsequently adjusted*, the image on the screen will gradually lose its definition and become considerably out of focus by the time the reel nears its end.

*Irregular* focus drift is evidenced by random transient losses of focus which are truly perplexing when the film is a supposedly uniform release print. Composite reels (those made up of trailers or other assorted individual rolls) are well-known examples of irregular focus drift.

It is almost impossible to detect the presence of focus drift in a reel of film except by actual projection, but all "kinky" films and those having a strongly set curl at either beginning or end are very likely to offer trouble from this cause.

Buckled film, we have seen, is caused by projection conditions. Accordingly, prints fresh from the processing laboratories are never buckled unless grossly mishandled. Focus drift, contrariwise, is often present in prints which are practically brand new!

The immediate cause of focus drift is film-curl, a more or less permanent deformation of the film base. Irregularities in frame embossing and variations in film thickness could also cause focus drift,

but there are good reasons for considering these factors negligible.

A progressively varying curl characteristic is "set" in the film by winding it too tightly on a small-hubbed reel and by storing film for a considerable length of time without rewinding it at intervals to change the direction of the film and to reverse the curvature of the convolutions. New prints which are laid away for long-term storage are curl-deformed rather rapidly, but in many cases it is better to let the film become curled than to risk possible scratching by periodically rewinding it.

### **Labs and Exchanges Lax**

An irregular curl characteristic is produced by variations in the tension of the film in its long and devious journey through the processing machinery and by irregularities in the forced drying of the emulsion. In fact, the loss of the moisture absorbed by the emulsion from the developing, acid fixing, hardening, and several washing baths is not actually complete for a long time after the film looks and feels perfectly dry.

New film is soft, pliant, susceptible to deformation. Any stresses and strains to which the emulsion may be subjected during the "curing" period will be transmitted to the film base and produce a tendency to curl. "As the twig is bent so will grow the tree" is an adage applicable to new film.

The correction of focus drift by treatment of the film is usually out of the question in the case of full-length reels. The trouble would be greatly minimized, however, if the film laboratories and exchanges, when preparing new prints for distribution, would wind them "feet first," emulsion side facing out, and leave them backwards until shipped to the theatres. The projectionist who "breaks in" the new print should be the first person to store it overnight in the normal "head-first" order for showing.

This simple treatment prevents a tendency toward curl deformation by delaying "setting" of the film convolutions in their "normal" curvature, and at a time when such a prophylaxis is most effective. Distributors should be especially delighted by the fact that this expedient doesn't cost a penny.

Short rolls of film may be "uncurled" by winding them up tightly in the same direction as they are found (head-first if the roll has been stored head-first for a long time), but with the direction of the emulsion reversed to counteract the natural curling. The rolls of film should then be secured with tight bands and put away for a week.

High-acetyl acetate film is somewhat inferior to nitrate film in the matter of

curl-deformation susceptibility. Since focus drift is a more common evil than buckling and image flutter, it is clear that further improvements in safety film are needed.

### **Focusing Methods**

Because focus may vary from reel to reel or even from section to section of the same reel, it cannot too often be repeated that the projectionist must keep a sharp eye on the condition of the focus if the very best image definition is to be obtained at all times. Projectionists operating in theatres where lenses of very short focal length are used will find the unavoidable changes in the required position of the lens especially bothersome.

Maximum working efficiency of the lens is insured by checking the focus at the beginning and middle of each reel and at each change in the type of film during a reel—from black-and-white to color, for example.

"Checking the focus" does not mean testing the focus by actual adjustment of the lens. Unnecessary "monkeying" with the focus adjustment is to be avoided at all costs, for the audience is irritated to desperation by a picture swinging in and out of focus for no apparent reason. The skilled projectionist checks the focus with his eyes and *not* with his fingers, and he turns the focusing knob to *correct* the focus—never to *test* it!

Except in the case of soft-focus and other difficult scenes, any deviation from perfect focus can be perceived *immediately* by any projectionist with normal eyesight. When such deviation is apparent, the focus is sharpened; otherwise the lens is left strictly alone. And even when the focus is to be sharpened, an attempt must be made to do so without bringing it to the attention of the audience.

Should the picture for one reason or another fall considerably out of focus, however, the lens should be restored to its correct position as quickly as possible; the audience will appreciate the alertness of the projectionist.

A more delicate problem arises when the picture is only slightly indistinct. The question is whether the projection or the film is at fault. In such an event the projectionist may rightly concentrate on improving matters (if they can be improved), but he must not forget that *good* projection is *unobtrusive* projection.

When the focus is sharpened skilfully, not even the most eagle-eyed patron will be aware of the change while it is being made. But the same person will know that the projection is sparkling, lifelike, and crystal-clear even though he be wholly ignorant of the constant vigilance

and untiring efforts by which the projectionist maintains a perfect picture.

To obtain and maintain a perfect focus is utterly impossible when the lens is positioned by aligning a notch or mark on the lens barrel with a reference point on the mechanism. This method is useful for replacing a lens which has been taken out for cleaning, but it would be a mistake to think that a lens could be placed in exact focal position that way. A picture can be focused only by looking at it on the screen and adjusting the position of the lens when required. There is no other way.

### **Difficulties with Old Heads**

The focusing operation is comparatively easy with modern projector mechanisms having precision micrometer focusing devices. But smooth focusing is far from easy with old-style mechanisms having simple rack-and-pinion devices for moving the lens.

Only familiarity with the "feel" of the focusing lever or pinion rod of the older heads will enable the projectionist to focus without overshooting the correct position and thereby inviting audience attention to the process. The installation of a new rack-arm friction spring on the Simplex Regular (part no. S-343-A) sometimes helps when the lens-mount slide is too loose or jerky in action. Absolute cleanliness and mild lubrication of the moving parts of the focusing device is extremely desirable.

Projector manufacturers, in an effort to modernize old-style heads, have provided micrometer focusing attachments to replace the original pinion focusing knob and handle (pinion rod). The writer's experience with these attachments has not been satisfactory. There is far too much backlash and lost motion in the train of moving parts between the focusing knob and the lens-holder slide to permit a prompt, smooth movement of the lens. The knob may be turned through a considerable part of a complete revolution before the lens-holder slide "takes up." When at last the lens does move, it may be found that the knob has been turned in the wrong direction, necessitating a repetition of the tedious process in reverse.

### **Wear, Maladjustment Affects Focus**

Projectionists who are accustomed to those attachments and like them should keep on with them, but those who find them more or less of a nuisance should not hesitate to replace them with the original pinion-knob and rod assemblies.

Wear and maladjustment of the projector mechanism may have serious effects on the optical performance of the lens. The condition of the film trap, or

(Continued on page 26)

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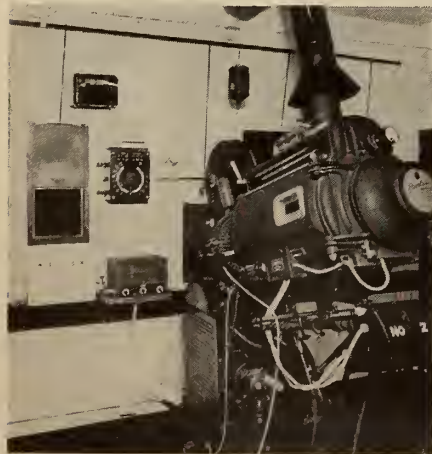
**I**F THE consumption of human nervous energy could be measured in ergs or some other scientific unit, the ensuing tabulations would disclose that enormous amounts of it are used up daily at the trying job of watching the arcs in the world's theatre projection rooms. The projectionist has a variety of exacting duties, but most of these tasks occur at spaced intervals; whereas the necessity for keeping "half an eye" on the arc puts an unceasing strain on the projectionist, whether he be aware of it or not, from the moment the show starts until it breaks.

The writer, an "operator" since the days of the calcium light and the hand-crank, made up his mind several years ago that there must be *some* way of freeing projectionists from the harassment caused by the antics of inherently unstable projection arc lamps. As we all know too well, a pair of lamps will burn perfectly for hours; then, just when the projectionist gets busy attending to some duty, an arc carbon will take off in one direction or another, and up comes those exasperating three buzzes from some one downstairs to indicate that the picture has become blue or brown, or possibly has entirely disappeared from the screen.

The writer's first arc monitor was a cumbersome and costly rig, comprising a metal box with a phototube erected on each lamp, with wires strung from there to an amplifier cabinet, and a dynamic speaker which sometimes gave forth with a signal when an arc got out of optimum position. This outfit was hard to adjust and was broad in its action. In short, hardly anyone could use it but its inventor.

About this time, the author was booming around in Mexico and there fell in with some gentry who engaged him to develop a black-light signalling outfit for the purpose of secretly flashing informa-

\* Seven patent claims on this invention were allowed by the U. S. Patent Office on August 5, 1949.



White line indicates path of actuating light-beam to monitor which is mounted above and to the right of projection port.

# The 'Arcon' Projection Arc Monitor\*

By VOLNEY G. MATHISON

*Accurate control of the feeding of the carbon arc has long intrigued some of the best engineering minds; but, significantly, the most notable contributions to the solution of this vexing problem have been made by those with practical day-to-day projection experience. Described herein is another contribution from the ranks of practical workers in the art which, already used in a number of theatres on the Pacific Coast, merits serious consideration by all concerned with the projection process.*

tion out of Mexican racetracks. In the course of developing the black-light apparatus, it suddenly became apparent that some of the color filters and other things used in the racetrack gadgets might be applied to the projection arc monitor.

## Spectral Characteristics Required

Phototubes with the so-called S-1 type of cathode, such as the 918, have two sensitive peaks, one in the violet end of the visible light spectrum around 360 millimicrons, and the other in the infrared, peaking at 800 millimicrons.

As is apparent on the indicator card of any Suprex arc lamp, the area of the arc between the negative carbon and the gas ball emits a good deal of light at frequencies corresponding to violet and blue. Viewing the arc through various color filters discloses that the gas ball gives out a light of mixed frequencies—that is, a "white" light—while the crater rim of the positive carbon emits an intense radiation at frequencies corresponding to a very deep red.

Hence the writer conceived the idea of placing color filters in the auxiliary beam of light used to actuate the phototube of an arc monitor, the filters being of a type to cut off all but deep red light. This scheme resulted in a great improvement in the selectivity of the monitor, since the violet and blue light in the space between the negative carbon and the gas ball was effectively screened out, and only the light from a more limited area of the arc could get through to hold in the phototube apparatus.

This arrangement was nonetheless un-

successful, since the strong red and infrared light used to operate the instrument proved to be highly destructive both of filters and phototube cathode surfaces. Also, the device was still just a one-way monitor—that is, it would warn the projectionist only when the positive carbon began burning too far away from the lamphouse mirror, producing a blue picture.

## Filtering Infra-red Emanations

It worked fine in this respect, but when the positive carbon was overfed and began burning toward the lamp mirror, producing a brownish light on the picture, the monitor merely sat tight and did nothing. No signal.

Further study of Suprex arcs revealed that the reason for this was that the en-



Commercial model of the Arcon monitor, actual size of which may be determined in photo of projection room at left. Small discs shown at top of Arcon above controls pick up actuating light-beams from projectors 1 and 2, respectively.

tire end of the hot positive carbon emits a powerful infra-red radiation extending back as much as  $\frac{1}{8}$  inch from the rim of the arc crater. Since the standard phototube with the S-1 type of cathode is highly sensitive to this infra-red radiation, it refuses to indicate a weakening light when it is "looking at" the hot red side of the end of a positive carbon.

A search began, therefore, for some means of cutting off sharply the infra-red frequencies radiated by the positive carbon. Laboratory types of anti-infra-red filters are common, but the most efficient ones are wet-cell in form and impracticable for use in a projection arc monitor. Others are made of gelatin and tend to fade out under prolonged exposure to an infra-red beam. Various combinations were tried without satisfactory results.

But one day the writer picked up a piece of Mexican jewelry made of pale greenish beryl—a variety of emerald—and experimentally stuck it into the light beam between a projection arc and a monitor. The results were magical! The selective action of the monitor was hard and crisp, and equally so against either blue or brown light. The infra-red radiation of the positive carbon was blocked, or at least greatly reduced, and only the brilliant visible red light at the extreme rim of the crater of the positive carbon was getting through to the phototube.

Photographs of a projection arc taken through compound filters made up of the original anti-blue filters and the new beryl filter revealed an image resembling a sharp white line less than  $\frac{1}{40}$ th inch in width at right angles to the axis of

the positive carbon. This was actually a picture of the extreme edge of the gas ball where it lies in contact with the positive carbon. The color filters blocked the radiation from all other portions of the arc—that is, to a relative degree, which is all that is required.

The source of the beryl that stopped the infra-red light was investigated and it was found that the mineral came from the slopes of an extinct volcano. For a time filters were made up of this mineral, but it was extremely hard to work, having to be sliced up with a diamond saw. Samples were eventually burned in a spectroscopic arc and the metallic elements responsible for the anti-infra-red action were determined. An infused manufactured plate glass of equivalent characteristics is now used in the monitor filters.

### 'Reduction to Practice'

With these rather big things to work with, the inventor thought his project was nearly completed; but this was not the case. It still was necessary to make what the patent office calls "reduction to practice," which in plain "Skidrow" English means taking the bugs out of the gimmick and producing a usable commercial device.

This involved the development of a rugged and reliable photoelectric amplifier of a type that would operate on a gradual change in intensity and quality of the arc light and at the same time *not* respond to the momentary flickerings that constantly occur owing to impurities or traces of moisture in the carbons. The usual types of amplifiers that would respond to a continuous unmodulated light beam were without exception costly and unstable.

This problem was finally solved through the use of a mixer-amplifier tube in the first stage of the circuit, the suppressor grid of this tube being fed a modulating voltage from a separate oscillator, so that a sort of one-sided superheterodyne action is obtained. From here on amplification is obtained by conventional resistance-condenser coupling circuits, terminating in an a.c.-operated signal vibrator.

Other circuits have since been developed, including one whereby the monitor functions only when a picture is being run, the instrument automatically turning itself off during intermissions and at the end of the show.

### Details of Unit Operation

The schematic design of the basic invention is shown in Fig. 1, which is a partial copy of the original patent application drawings. In this illustration (which is, of course, non-proportional), the two projection arcs are represented at 25. A light-hole, 24, is drilled in each

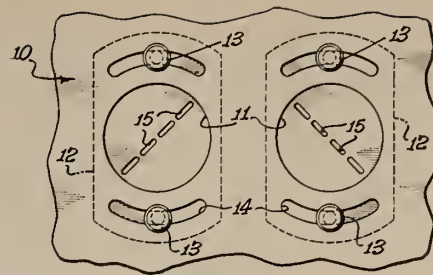


FIGURE 2

lamphouse above the arc, so that a line drawn from the arc to the hole is as nearly as possible at a right angle to the axis of the positive carbon. It is not usually possible to get the light-hole precisely at a right angle to the carbon tip and axis because of interference from mirror-shield paddles and levers in arc lamphouses. In such cases the actual location of the light-hole is slightly forward of the arc, but must be no more than is absolutely necessary to afford an unobstructed view of the arc from the hole.

The light beam emerging from the light-hole strikes a mirror, 26. This mirror is cemented onto a ball-and-socket fitting which is mounted in a second hole drilled into the sheet metal top of the lamphouse. The actual location of the light-hole and mirror is up on the top side of each lamphouse, directly at the side of the chimney in the Brenkert and the Magnarc lamps, and toward the rear of the chimney in Ashcraft lamps.

Paper templates are supplied showing the correct location of the light-holes: without these it is rather difficult for anyone but an experienced installer to get them in the right place.

The light reflected from each ball-and-socket mirror strikes one of the adjustable shutters, 12, of the monitor. The shutters shown in the illustration have a linear series of perforations, this construction having been used to protect the fragile gelatin filters that were at first used in the system. After the development of plate glass anti-infra-red filters, this type of shutter was replaced by another having a single long slot instead of a row of small slots. The action is identical in either case.

### 'Intensity Equalizer' Developed

Secured onto the back of each shutter is the compound color-filter assembly, 16. Mounted horizontally behind and somewhat above the shutters is a phototube, 17. The phototube actuates the amplifier and associated signal vibrator circuit.

Figure 2 shows in detail the orifice and the path followed by the light beam.

Not shown is a recently developed "intensity equalizer," consisting of an additional rotatable variable-density filter,

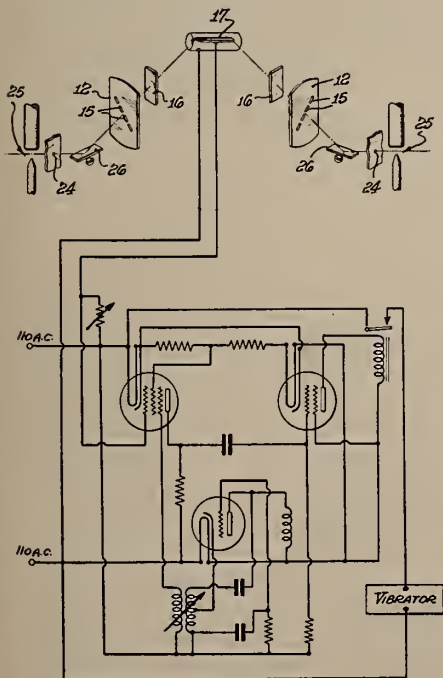


FIGURE 1

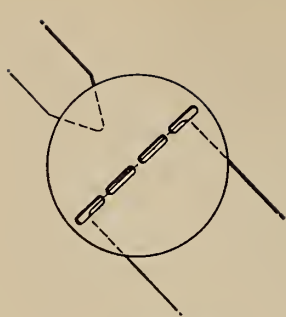


FIGURE 3

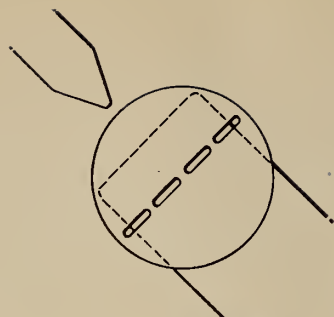


FIGURE 4

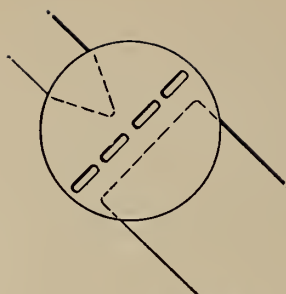


FIGURE 5

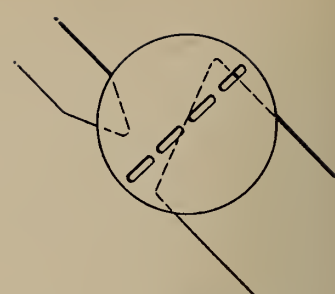


FIGURE 6

whereby light beams of differing intensities from a pair of lamps are matched up inside the amplifier cabinet. Previously, it was necessary to match up the light beams by carefully reaming the light-holes in the lamphouses until the response of the monitor was the same on either lamp.

By rotating the equalizer control, the monitor can be caused to respond to either lamp with equal sharpness, regardless of differing intensities of the two light beams projected alternately onto the monitor shutters.

As shown in Fig. 3, the image of the end of a positive carbon is aligned on the slots in a shutter, the shutter being rotated and clamped so that the slot line is at a right angle to the lengthwise axis of the carbon image.

If the positive carbon now burns toward the main lamphouse mirror, the image on the slots will move toward the position indicated in Fig. 4, resulting in a reduction of intensity of light reaching the phototube; consequently the monitor operates and produces a signal. If the carbon moves away from the main lamphouse mirror, the image on monitor shutter moves toward the position shown in Fig. 5, likewise causing a signal.

Equally important, if a carbon turns off crookedly, as indicated in Fig. 6, its image will become misaligned with the shutter slots, reducing the amount of light reaching the phototube, and the monitor will operate.

### Negative Carbon Control Data

The monitor does not respond directly in the case of the negative carbon moving forward toward the positive carbon. A monitor that closely watches the negative as well as the positive carbon has been built; however, it defeats the main purpose of the invention, as it makes such exacting demands for perfect adjustment of both electrodes that one cannot leave the lamp for any length of time. Hence only the positive carbon is monitored; this is the actual source of the light.

Nonetheless, the monitor is very sensitive to misalignment of the negative carbon—upward, downward, sidewise, or

backward. In all such cases, the image on the shutter will develop a misalignment similar to that indicated in Fig. 6 and the monitor will operate. In fact the monitor gets very mad and cranky when a pair of carbons are misaligned in any way, and will not quiet down until the positive carbon has been squared off and a good crater once more formed.

### Dual-Circuit Unit Elective

Projectionists who have not actually used one of the monitors occasionally express concern over the fact that the instrument does not directly "watch" the negative carbon. The answer to this point has three aspects: (a) a four-shutter, dual-circuit monitor that watches both carbons separately is available at a price 50% above the regular model; (b) purchasers are asked to try the regular model, at least for a few days, in order to "get used" to it, with the option of then exchanging it for the dual-circuit model if they wish; (c) up to the present time not one user has shown the least desire to make the exchange.

The monitor functions on a basis of both correct color and maximum intensity of the light. It insists—with an adjustable tolerance—upon that adjustment of both carbons which affords optimum registry of the picture actually being projected. The ability of the instrument to do this with a single pair of slots is largely due to the use of color filters; this is one of the basic features of the invention.

### Extreme Sensitivity Cited

The monitor amplifier has two sensitivity controls, one in the first stage and another in the second stage. By manipulating these controls, the overall selectivity of the instrument can be adjusted to any degree of sharpness or broadness desired. When burning stubs in carbon-savers, a somewhat broader adjustment is necessary than when burning clean carbons, as the light is usually a trifle off-quality with the stubs, and the monitor immediately detects this fact.

This device is really a simplified and streamlined adaptation of an optical-electronic, light-signal receiving instrument that (the learned engineering consultants

estimate) cost \$6500 to build and is of such *sensitivity and selectivity* that it will respond to the flame of a match burning at a distance of 2000 feet—in bright sunlight!

The learned engineers also said that it was impossible to build an effective dual-arc projection monitor to sell for a penny less than \$500; but the writer, fortunately, was blissfully unaware of this "expert" opinion—which is why West Coast theatres have installed these units at a cost of only \$86.50

The Arcon provides the art and the craft of projection with a proven precise means for eliminating a serious operating defect of altogether too long standing.

### Proper Use of Electric Tools

Words of advice that never lose their timeliness are these four injunctions anent the use of electric tools, as published in the *Electrical Workers' Journal*:

1. Use only equipment in good condition and take good care of it. Neglect may cost a life—perhaps yours.
2. Be sure any portable tool is properly "grounded." This "ground" is your life line.
3. Beware of bad insulation, bad connections, defective plugs, unsafe switches, sparking brushes.
4. Never use an electric tool in the presence of flammable or explosive vapors unless especially designed for such use.
5. Never overstrain an electric tool, thus overloading the motor.

*Even 110 kills now and then!*

### Projection of Industrial Films

Projectionists who are active in the production and showing of 16-mm industrial films will be interested in the 28-page booklet offered by Ampro Corp. which gives detailed information about the various aspects of this rapidly-growing field. Thousands of these booklets have gone out to industrial firms, thus it would seem to be politic that projectionists be equally well informed about their daily work.


In addition to various commercial aspects of the industrial film field—such as the booking (rental and purchase) of films, the requisite facilities for showing—the booklet offers not a little technical information which will aid in making a good show better. Address Ampro Corp., 2835 N. Western Ave., Chicago 18.



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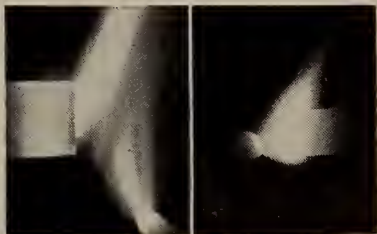
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# Questions and Answers on Safety Film

**T**HE appended questions and answers regarding Safety Film (the improved acetate stock known as High Acetyl Film which is now in circulation) was prepared by Eastman Kodak Co. for distribution among motion picture studio safety engineers.

## WHAT IS SAFETY FILM?

The American Standards Association defines Safety Film as follows: "Photographic films are classified as safety-photographic film if they are difficult to ignite, slow-burning and low in nitrogen content. It defines in ASA Z38-3.1, 1943, the laboratory methods of test and analysis for determining whether a given film conforms with this standard.

## WHAT IS THE FIRE HAZARD OF SAFETY FILM?

Underwriters Laboratory, in its "List of Inspected Gas, Oil, and Miscellaneous Appliances," lists the various makes of Safety Film as "slow-burning" and states that the "fire hazard of these products in use and storage is judged to be of the same order as that presented by common newsprint paper in the same form and quantity."

## WHAT IS IT MADE OF?

The base is made by combining cotton or wood pulp with acetic acid, the acid found in vinegar. Propionic or butyric acids, which are very similar, are sometimes used in conjunction with the acetic acid. The products are called cellulose acetate, cellulose acetate-propionate, or cellulose acetate-butyrate.

## WILL SAFETY FILM BURN?

Yes. Safety Film will burn if ignited with a match or other source of flame. Generally, it will go out of its own accord, but if it is in a loose pile it may burn almost as rapidly as paper.

## IF IT BURNS, WHY CALL IT SAFETY FILM?

The term "safety" is generally used in a comparative sense. When the old high-wheeled bicycle was replaced by the modern bicycle, the latter was called a "safety" bicycle. It was obviously safer than the old "high-wheeler."

Safety razors are so called not because one cannot cut oneself but because the danger of a bad cut is less than with the old straight razor. In the same way the term "safety film" has been used for a long time to differentiate the very much safer acetate film from the more dangerous nitrate film.

## WHAT HAZARDS DOES SAFETY FILM AVOID?

Safety film avoids the principal hazard

of nitrate film. Nitrate film burns very rapidly indeed. When a roll is thoroughly ignited it cannot be extinguished with a fire extinguisher nor even by immersion in a bucket of water. This is because it carries its own oxygen supply within itself in the form of the nitrate group.

Nitrate film can be very easily ignited. Even a glowing cigarette can ignite it. When burning with a restricted supply of air, it gives off fumes which are extremely toxic. Safety film avoids all these hazards.

Although Safety Film will burn, it burns very slowly. Generally, it will go out of itself unless it is piled loosely on the floor so as to be in a very favorable condition for burning. It can easily be put out by smothering it with water, or even by blowing it out.

## DOES SAFETY FILM INTRODUCE ANY NEW HAZARDS?

Yes. It introduces the hazard of carelessness. This hazard will not be great until most nitrate film is replaced by Safety Film. When the time comes that nearly all pictures are on Safety Film, strict observance of regulations will be relaxed; usual precautions will not be taken. At that time an occasional reel of nitrate film may find its way into a projector that is not properly maintained, and a disastrous fire may occur.

A portion of a reel of Safety Film may become damaged and a replacement be spliced in. The replacement might be on nitrate film. This reel might be run under projection conditions not suitable for nitrate film. The danger is obvious.

## WHAT ARE THE BEST MEANS TO AVOID THIS DANGER?

Very few dangers are really bad if they are thoroughly recognized and understood. Constant attention, education, and publicity are the best safeguards.

## DOES SAFETY FILM GIVE OFF DANGEROUS GASES WHEN IT DOES BURN?

The smoke given off by Safety Film when it burns or when it is roasted by an external source of heat is somewhat more irritating than ordinary wood smoke. It is not more dangerous than the smoke generated in ordinary types of fires.

## HOW CAN YOU TELL WHETHER FILM IS NITRATE OR SAFETY?

The manufacturers print their company name together with the words "Safety Film" between the perforations and one edge of the film. This is not visible until the film is developed. Then it shows up in sharp black letters.

Inexperienced people are often misled, however, because of the fact that in motion picture work images are transferred from one film to another. Thus the lettering that appeared on the negative film in black would appear on the positive in white. This makes it possible for the words "Safety Film" actually to be printed on nitrate film.

The one sure test is the burning test.

## CAN THE BURNING TEST BE MADE SAFELY?

Yes. It can be made safely but only if the right precautions are taken. The burning test should never be made in the same room where film is kept. It should never be made on film in a roll, or even on a large piece of film.

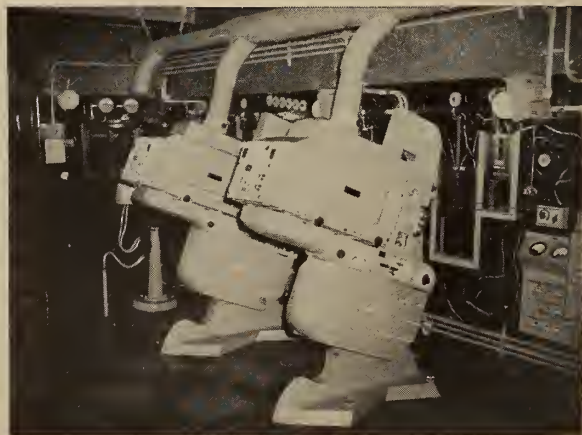
A single frame should be cut from the roll. This piece of film should be taken to another room where there is no fire hazard. It should then be ignited with a match.

Any one familiar with the way nitrate film burns can immediately tell whether it is nitrate or acetate. Nitrate film burns fiercely, while acetate film burns quietly and may even go out of itself. A glowing cigarette can burn a hole in acetate film without igniting it, while nitrate is almost always ignited.

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The new G-K 21 projector which is regarded in British technical circles as the "last word" in motion picture projection. Not a few of these units are now functioning in Canadian theatres. IP hopes to present soon a detailed description of this Kalee mechanism as compared directly with components of American projectors.

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# TELECASTS

## SMPE Asks 60 Channels for Theatre Tv; RCA Color Tv

**H**IGHLIGHTING the past month's developments in the television field was the filing by the Society of Motion Picture Engineers, on behalf of the motion picture industry generally, of the answers to the series of questions posed recently by the Federal Communications Commission in connection with the establishment of a nation-wide theatre Tv service; and the announcement by RCA that it had perfected a system of color Tv which, by means of an attachment, could be received by existing home Tv sets.

The SMPE's statement set forth that a theatre Tv network would be important because it would provide, among other things, instantaneous communication service to a large segment of the American people and during times of emergency would be available for exploitation in the interests of public morale and government service. As such, the service would be totally unrestricted as to particular groups, serving the public at large. For these reasons, the potentialities of theatre Tv should be studied carefully by the government and should be supported in the interests of aiding a new industry.

### 60 Channels for Quality Image

Programs would be picked up from remote field locations, Tv studios or theatres, sent to a central studio or transmitter, being then distributed to theatres. R.f. channels would be required to carry the picture and sound from point of origin to theatres either on a local basis, between nearby cities, or on a nation-wide basis, depending upon its commercial success.

Believing that picture quality would have to be ultimately as good as motion pictures are today, the SMPE recommended that the FCC provide wide enough channels to allow such development. It was indicated that growth toward improved quality would have to begin from the present broadcast standards of 525-line, black-and-white. Channels 50 megacycles wide, it was estimated, would be needed to give the necessary high quality of picture in b-and-w and also subsequently in full color.

As many as 60 different channels might be needed for a complete and thoroughly

competitive nation-wide theatre Tv system. In any given locality, fewer channels might provide adequate service.

### Means for Distributing Programs

A prime interest of the FCC was whether common carriers could handle the distribution of theatre Tv programs, leaving the air waves available for broadcast and other services. The SMPE replied that the common carriers could not now transmit the quality of picture needed, nor do they have sufficient cable facilities available to deliver any kind of picture extensively. In fact, such facilities are so limited at the present time that the present broadcast networks are forced to work out a channel-sharing schedule for inter-city distribution of programs.

The SMPE feels that a coaxial cable might not be able to deliver necessary picture quality even after several years of additional research, and therefore told the FCC that radio frequencies would be needed regardless of whether the motion picture industry distributed its own programs or they were carried from point to point by the telephone company.

This was the third time in five years that the SMPE filed statements with the FCC favoring the allocation of frequency bands for theatre Tv. In 1944 and again in 1947 the SMPE asked for specific allocations, and certain channels were set aside each time for *experimental* use. The present question is one of *commercial* use, and the FCC's decision may well decide the fate of theatre Tv.

### Tight SMPE-Theatre Accord

Conferences have been held recently by the SMPE with Theatre Owners of America, the Motion Picture Association, and several other industry groups in an attempt to provide a well-rounded picture of what theatre Tv means technically. When asked about programming and the economics of such a service, the Engineers bowed out, saying that those were questions which ultimate users of theatre television would be required to answer for themselves.

To help them find these answers, several important factors were presented by the SMPE to the FCC. Among the things which must be considered are: the qual-

ity of the picture required; the availability of circuits which would allow rapid service to his own or other theatres; the number of channels needed to pick up and distribute programs; the availability of equipment for expanded service and the construction and maintenance costs of installations as well as of distribution facilities.

Industry trade groups, including TOA and MPA have stated publicly that they will support the position of the SMPE and will also ask the FCC to hold a public hearing where all united and diverse interests may be heard.

\* \* \*

## RCA Electronic Color System

RCA's announcement of a new system of transmitting Tv in full color, which eliminates virtually all of the major technical and economic problems that have delayed a changeover from the present black-and-white pictures, put other broadcasters in a dither and occasioned no little concern among set dealers who foresaw a sharp decline in sales.

Under the RCA all-electronic system, as opposed to the CBS *mechanical* set-up, no changes are required in present transmission standards and home receivers now in operation will have continued usefulness. Existing receivers will need neither modification nor additional equipment to continue to receive b-and-w pictures from stations transmitting in color. Addition of an adapter, reported to cost \$75 at retail, would enable such sets to pick up images in color. New sets, in turn, would be able to receive programs in *both* color and b-and-w.

With all types of sets assured of continuing service, RCA said, both b-and-w and color stations could survive the transitional period in Tv without loss of audience. How to turn this trick without making obsolete the broadcasting and receiving equipment now being used has been a source of sharp controversy in the Tv industry for many years.

### How the RCA Color System Works

In technical terms, the RCA unit uses three separate signals for the primary colors of Tv—green, blue and red—which are sampled electronically and then combined into one over-all signal which is transmitted. At the receiver the

(Continued on page 27)

# New Series of Lenses for 16-mm Professional Projection†

A. E. NEUMER

Bausch & Lomb Optical Company

Here is the low-down covering the mounting, optical performance, and optical design of a new series of 16-mm projection lenses for professional use. Focal lengths of 2 to 4 inches, in half-inch steps, with speeds of F:1.6 are provided. Measurements of resolving power, optical corrections, and vignetting are included.

THE lenses currently used in practically all 16-mm projectors traditionally have been of the Petzval type, designed originally by Joseph Petzval in Vienna around 1840 primarily as a portrait lens. The basic design has remained the same, although numerous detailed changes and improvements have been made over the years.

Essentially it consists of two sets of lenses, each set separately achromatized and with a comparatively large separation between them. The front half is usually cemented, while the rear lenses are separated by a small air space as shown in Fig. 1.

The basic form was notably improved by Dallmeyer, who in 1866 reconstructed the back combination by reversing the elements and changing their shape. Further changes have been made by unceasingly the front combination, thereby giving an extra degree of freedom in the design. This step has the obvious disadvantage, however, of adding two extra air-glass surfaces which tend to reduce the over-all transmission and contrast in the image.

The Petzval construction readily lends itself to lenses of very large aperture ratios with excellent center definition, but the covering power is seriously limited by heavy curvature of field which

becomes noticeable a few degrees off the lens axis. Many attempts have been made to flatten this field both artificially, in the parlance of the lens designer, by introducing large amounts of astigmatism, or by adding a field-flattening element close to the film plane.

In spite of all these efforts, a good state of correction of the field aberrations has never been achieved. Nevertheless, considering the factors which in the past have motivated 16-mm projector design, the choice of the Petzval lens was seemingly justified in that speed and cost were factors of more importance than screen definition.

Because of the limitations imposed by the Petzval design, mainly on resolving power, and because of the demand for a better lens, about 15 years ago designers abandoned it for 35-mm projection in favor of an anastigmat design. "Anastigmat," as used here, means a lens corrected simultaneously for astigmatism and curvature of field and, at the same time, being fully color-corrected. The latter requirement is equally important for black-and-white as well as color film.

## Basic Form of New Series

Such lenses were in rather common use in photography but were of relatively low speed, therefore, it was apparent at the outset that a more complicated and therefore more expensive lens form would have to be developed.

As far back as 1921, Lee in England had succeeded in developing a 6-element anastigmat type which worked reasonably well at an aperture of F:2. This lens, which can be traced all the way back to the original Gauss telescope objective, consists of two single outside elements with two cemented doublets in between. This basic design formed the background for the F:2.3 Baltar and later the F:2 Super Cinephor.

Because of the unusual success of these lenses, and after a careful survey of other possible approaches, it was decided to use the same basic form for the Super Cinephor 16, in focal lengths from 2 to 4 inches in steps of ½ inch, all rated at F:1.6 (see Figs. 2 and 3).

## Light Source Requisites for 16-mm

One of the big differences between 16- and 35-mm projectors is in the inherent need for faster lenses in order to achieve sufficient screen illumination.

The main reason for this is that because of the desire to make most 16-mm equipment portable, the use of carbon arcs with their attendant power supply is not feasible. The only alternative is to use a tungsten filament or, as has more recently been suggested, a concentrated arc.

However, the inherent brightness per unit area of a projection-type tungsten filament is something of the order of 1/7 that of a low-intensity carbon, and about 1/30 that of a high-intensity carbon. Similarly, the concentrated arc has an inherent brightness per unit area about 1/1.75 that of low-intensity carbons and 1/8 that of high-intensity carbons.

Furthermore, even if carbon arcs are used in the 16-mm projector, since the magnification is usually much greater than with 35-mm, the brightness per unit area of the screen will be much less.

## Fast Lens is Imperative

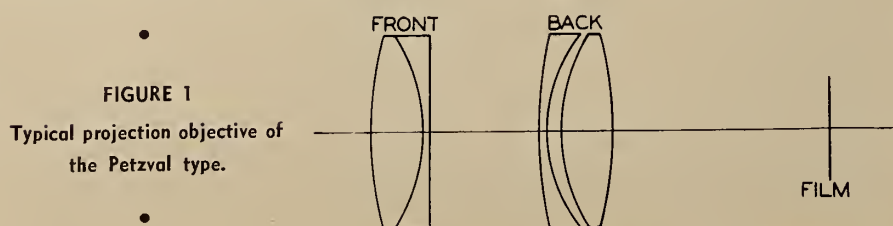
The result of these factors is that for 16-mm projection a fast lens is imperative. To the lens designer this imposes a most formidable problem since aberrations increase rapidly with lens speed.

Spherical aberration, for example, increases as the square of the aperture. Thus, an F:1.6 lens identical to and of the same focal length as an F:2 lens would have more than twice the spherical aberration. Furthermore, since image detail on the 16-mm frame is smaller than on the 35-mm frame, the 16-mm projection lens should be capable of resolving powers considerably in excess of its big brother if it is expected to do the same type of job.

Considering all these factors, the design of the Super Cinephor 16 was not easy. It was completed only after about two years of painstaking effort and was greatly abetted by the use of new dense barium crown glasses which up to the present have not been generally available.

## Tests Exceed Fondest Hopes

Each focal length in the series was designed individually, but they are all of the same basic form. The final results on paper looked extremely promising, but frequently it happens that a particular pattern of aberrations which looks well according to computations will add up to yield a poor actual result. Therefore, final specifications were not released until sample lenses of each



†J. Soc. Mot. Pict. Eng., May 1949.

focal length were made and thoroughly tested.

The results of these tests exceeded our fondest hopes. For example, the 2-inch lens, which can be considered as the standard focal length, at full aperture has a measured spherical aberration of about 0.1% of the focal length, or 50 microns. At the extreme corner of the 16-mm frame there is no measurable astigmatism, but approximately 0.2%, or 100 microns, inward curvature of field.

A more understandable picture of what these corrections mean can be obtained from the fact that any lens of the series will resolve visually more than 90 lines per mm anywhere in the 16-mm frame. This is not only about double what the average Petzval lens will resolve in the corners of the frame, but in addition the quality of resolution, which is the one hidden factor in any statement of resolving power, is excellent.

While the Super Cinephor 16 is classified as a projection lens, actually, in every respect, it is a high-quality photographic lens.

No lens is any better than it is mounted, and for that reason a considerable amount of thought was given to the case, keeping in mind the particular application. We have experimented and actually used for some time a one-piece barrel type of mount the inside of which is a true hollow cylinder. The lens components are individually mounted into cells which are accurately turned to fit the inside diameter of the barrel.

#### Various Precise Assembly Steps

Assembly is accomplished by stacking the cells inside the barrel with the addition of spacer rings, plus the addition of a threaded retainer at one end to complete the job (Fig. 4). This method has been quite successful, but it does not eliminate some of the troubles which have always been a problem in lens-mounting.

First of all, the lens cells must be accurately turned to fit the barrel with no more than about 0.001 inch clearance. Second, the degree of centering possible depends on how accurately the lens elements can be edged and how well they can be fitted to their respective cells.

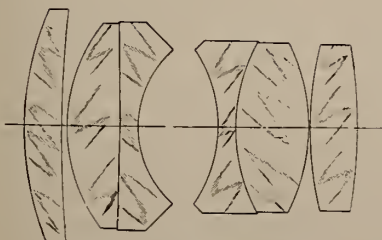


FIG. 2. Super Cinephor 16.

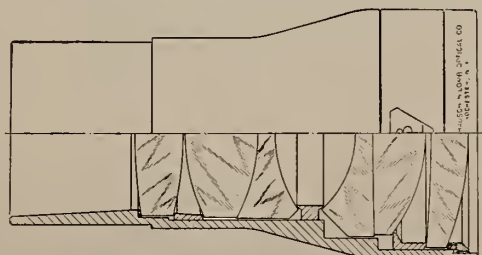


FIG. 3. Cross-section showing the mounting details of the 4-inch Cinephor 16.

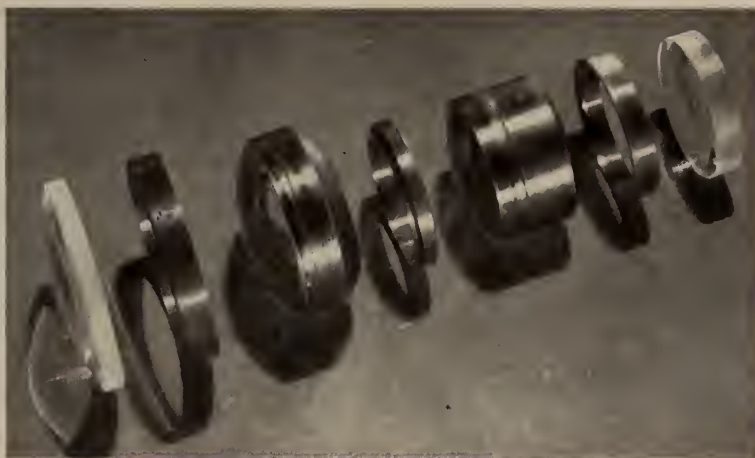


FIGURE 4

Exploded view showing the optics and spacer rings.

In actual manufacture, edging is a difficult operation, particularly on weak lenses, with the result that the finished diameter of a lens is not always concentric with its axis (the axis being the line through the centers of curvature of the two surfaces). All these sources of error frequently build up causing objectionable decentering and therefore rejection.

An entirely new technique has been developed in which the lenses are not centered by means of their edged diameter. Instead, spacer rings which are turned to fit the bore of the barrel contact the lens surfaces near the periphery. The elements are actually edged to a smaller diameter than the bore and are therefore free to seek their own center between any two spacer rings.

In other words, centering is effected by means of the differential thickness of the lenses and obviously eliminates the need for accurate edging as well as the expensive operation of fitting the elements to individual cells. When the spacer rings are designed correctly, this method has proved highly successful (Fig. 4).

#### Weight, External Dimensions

Because of the weight factor, all metal parts are made of aluminum with a dull black anodized finish inside and a satin anodized finish outside. This eliminates

the necessity of using any lacquer inside the mount and avoids the trouble encountered with lacquer eventually flaking off and sticking to the inner surfaces of the lens elements. Finally, the lenses are sealed at both ends against dust and moisture.

The external dimensions of all the lens mounts have been made in accordance with ASA standard Z52.1-1944. The diameter of the mounting section which fits into the projector is 2.062 inches. In addition, the 2-inch lens is being offered in the semi-standard 1 3/16-inch diameter, rolled-thread focusing type of mount which has long been used on both 8- and 16-mm projectors. Because of size limitations, it is not possible to fit any of the longer focal lengths in this style of mounting without reducing the speed.

#### Maximum Screen Light Obtained

As regards screen illumination with these lenses, every effort has been made to take full advantage of the F:1.6 speed. All air-glass surfaces are "Balcoted." However, so far as illumination is concerned, any lens is no better than the condenser and the light source behind it.

In the absence of no other interference in the projection train, it is the combination of these three elements which determines the total amount of lumens reaching the screen, and also the degree of uniformity of illumination from the center to the edge of the screen. While it is not the main purpose herein to describe condensing systems, a few words concerning them is in order.

Based on the published brightness values of a 750-watt, 25-hour tungsten projection filament, it has been computed that with a coated F:1.6 projection lens of the Super Cinephor 16 type, a perfect condenser, a mirror behind the lamp,

(Continued on page 28)

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**A** PRETTY sad condition prevails in many of our Local Unions. When members are taken ill and are unable to work, or are in financial straits, it is often necessary for the membership to pass the hat, so to speak, to aid the unfortunate member. Many of our more progressive Locals—notably New York Local 306 and Chicago Local 110—have pension funds, sick and death benefits, and other plans for helping needy members. These men are assisted during a period of stress without loss of human dignity and with a feeling of hope for the future. It should not be necessary to kill a man's self-respect while lending a helping hand, which so often happens when *donations* are made to carry him over a painful period.

- For having loyally served his local for 17½ years, Milton E. Franklin, former business agent for Local 577, San Bernardino, Calif., was awarded a gold life membership card. About 25 out-of-town IA men working out of the San Bernardino Local presented him with a beautiful diamond, mounted in the center of the engraved gold card.

- Robert G. W. Bennett is the new business agent for San Bernardino Local 577, succeeding Milton E. Franklin, who retired because of ill health.

- The Frenchy Biencourts of San Antonio, Texas, are celebrating the advent of a new member to their household—a son. Frenchy, business manager of Local 76 for a number of years, seems to be bearing up pretty well under the strain.

- Although the Provincial authorities decided against Canadian Locals 302 (Calgary) and 371 (Edmonton) in their fight to maintain the two-men projection shift, the matter is far from closed as far as these Locals are concerned. They are determined to continue the fight to regain the conditions that they voluntarily gave up during the wartime manpower shortage. Then, in order to keep the theatres open and operating, they agreed to a one-man projection shift, but *only for the duration of the war*. When the war ended,

however, the Alberta Theatres Association showed its appreciation of the Unions' cooperation by appealing to the Provincial authorities for a *permanent* one-man projection shift. The decision rendered by the Special Advisory Board is the result of a report submitted by its chairman, Hon. Mr. Justice C. C. McLaurin.

- Arthur Hamilton, 65, member of Boston Local 182, died several weeks ago while visiting his son, Ed, in Port Huron, Mich. Arthur was president of the Local back in 1919. Funeral services were held at Union, N. H., where he made his home during the past years.

- George F. Mills, old-time member of Local 223, Providence, R. I., was taken ill recently and is recuperating at the Wallum Lake Sanitorium at Wallum Lake, R. I. He would like very much to hear from his many friends in the Alliance; a note or a card would help greatly to cheer him up. How about it, boys?

- The annual meeting of the Wisconsin Association of Stage Employees and Projectionists was held at Eau Claire, Wis.,

on August 15, in conjunction with the Wisconsin State Federation of Labor meeting. The Taft-Hartley Law came in for considerable discussion, with talks on the topic being given by Thomas Shea, assistant IA president; Felix Snow, IA 6th vice-president, and Wm. Donnelly, IA representative.

Officers elected for the ensuing year are John Kunstman (Sheboygan Local 655), president; Glenn C. Kalkhoff (Milwaukee Local 164), vice-president; William Rieder (Fond du Lac Local 235), secretary, and Stanley Przlowski (Kenosha Local 361), treasurer. Oscar E. Olson, Milwaukee Local 164, was elected to represent the State Association on the 9th District IA advisory board.

A large delegation from Chicago Local 110, headed by Gene Atkinson, business manager; James Gorman, president, and Clarence Jalas, treasurer, attended the meeting. At the close of the business session the delegates were the guests of Eau Claire Local 475 at a delicious luncheon.

- Leo Weiss, charter member and former secretary of Cleveland Local 160, was fatally stricken with a heart attack while on his way to the Stillman Theatre, where he had been employed as projectionist for about 20 years. He is survived by his wife.

- One of the highlights of the new bowling season (September 1949—May 1950) will be a return match game between the One-Sixty League of Cleveland (Local 160) and the Nightingale Club of Detroit (Local 199). The Cleveland team still is smarting from the defeat suffered last season and is determined to bring back to its headquarters the William (Bill) Kramer Trophy, now gracing the offices of Local 199.

Bowling has become a very popular sport with a number of IA Locals, with many of them forming their own clubs and competing with other teams. Tom Fitzgerald, member of the Cleveland club, has come up with a suggestion which we pass along. He suggests that all IA bowling teams get together and

## HONOR VETERAN CALIFORNIA IA MAN



George Schaffer (right), of Los Angeles Local 150, chats with Howard Neece (left) and Joe Godfrey (center), business agent and president, respectively, of Local 709, Ventura, Calif. The Ventura Local tendered Schaffer a gold honorary life membership cord for his many services to Southern California Locals. Present were Local 709 membership; Fred Loakes and Clarence Albecker, Local 150; Orin Johnston, Local 281, Paducah, Ky., and Walter Jeffries, Local 457, Superior, Wis.

line up a series of match games between the various Locals, with the best teams competing for a national trophy at a bowling tournament to be held every two years at IA conventions. To this end, IP will be very glad to donate the national trophy, suitably inscribed.

We should like to get the reaction from the Milwaukee, Chicago, Pittsburgh, Los Angeles, Youngstown, Cincinnati and other IA bowling clubs to the foregoing.

- By a vote of 54 to 51, Local 244, Newark, N. J., which has been under the supervision of the IA General Office for the past four years, will remain under International control. The election was authorized by the General Executive Board at the mid-summer meeting held in Denver, Colo., and was personally conducted by President Walsh.

The members were offered the alternative of Local autonomy provided they agreed to the following proposals:

1. All meetings to be peacefully and properly conducted.
2. All cliques, groups and clubs be immediately dissolved and none resumed or organized.
3. Voting machines to be used in all elections.
4. All International laws be complied with.
5. Louis Kaufman, former business agent, be barred from holding any office for at least five years.
6. Compliance with the Local's seniority laws.
7. No "permit," "apprentice," "junior," or "application" membership system be maintained in violation of the IA's Constitution and By-Laws.
8. Membership dues be reduced from \$180 to \$60 per year, plus a 2% assessment on gross earnings per year.

Under the emergency powers granted the International president, the IA took over control of Local 244 in September, 1945, after several meetings had broken up in fist fights and a majority of the members had petitioned President Walsh to step in. Since then the Local has been under the supervision of Thomas V. Green, IA representative, appointed by Walsh.

- Mike Mungovan, business agent of Local 25, Rochester, N. Y., did it again. He recently negotiated new contracts calling for an 8% increase. Mike is always on the beam, pitching for his men.

- We were shocked to hear of the sudden death of our very good friend, Ben Brown, charter member and former president of Cleveland Local 160 and, later, member of Pittsburgh Local 171. Ben was one of the old-timers in the Alliance, having been an IA representative during the Canavan administration. For

many years he was the chief projectionist for Warners in Pittsburgh, retiring from that post to devote his entire time to a theatre he acquired in Connellsville, Penna. He is survived by his wife, Rose; a son, Edwin, and a daughter, Shirley.

- One of our overseas subscribers, nameless here for obvious reasons, sent us a clipping from the London *Daily Express* in which Tom O'Brien, head of the British NATKE, was raked over the coals for his violent tirade against the United States. The *Express* accused O'Brien of "fishwife hysteria" and recommended that "he be repudiated by the delegates to the forthcoming Trades Union Congress . . . and that the Nottingham electors should reject him at the next General Election." What happened to the erstwhile genial Mr. O'Brien?

- Robert E. Shuff, son of John Shuff, business agent of Local 364, Akron, Ohio, has opened his own law offices at 1306 First National Tower Bldg., Akron, Ohio. He was formerly on the staff of the NLRB and was for five years assistant general counsel for the United Rubber Workers of America. We extend our best wishes to young Shuff for a most successful career.

- Latest addition to the ranks of IA journalists is Clyde Cooley, secretary of Locals 343, Omaha, Nebr., and 336, Council Bluffs, Iowa, who now writes a weekly column for *The Unionist*, a Labor weekly published in Omaha. Clyde's first column evoked memories of our younger days because it paid a much deserved tribute to Abe Blank, president of Tri-States Theatres. One memory of Blank

#### BOSTON LOCAL 182 HONORS PRESIDENT



In appreciation of services rendered Local 182 for the past 26 years, Joseph Nuzzolo, Sr., president, was recently presented with a gold life membership card. Shown here after the presentation ceremonies are, bottom row, left to right: Nuzzolo, Morris A. Goldman (vice-president), and Myer Bixgarne. Rear, Samuel Garfinkle, Walter F. Diehl (business representative), Charles Jandreau, Maurice Synder, and Joseph Caplan (treasurer).

persists: although he engaged in many a stiff tussle with IA Locals in his territory, all disputes were settled amicably without resort to a strike.

- Recent out-of-town visitors to the offices of IP: From Boston Local 182 came Joe Nuzzolo, president; Walter Diehl, business agent; Leon Narbut, financial-secretary, and Harold Kaitz, member of the executive board. Canadian callers were Fred Hoffman, Montreal Local 262; Wm. McCaul and Gus Demery, Toronto Local 173, and C. Dentelbeck, Jr., Local 461, St. Catharines, Ont.; from Syracuse, N. Y., came George F. Raaflaub, secretary of Local 376.

#### 25 Years Ago—September 1924

- John O. Benner, secretary of District No. 8, issued a call to member Locals to submit copies of their wage scales and working agreements. He announced that the office of District secretary was ready to take care of all matters brought to its attention. . . . The controversy between the Hippodrome Theatre in Taft, Calif., and Local 518 over the use of remote controls was satisfactorily adjusted by Cleve Beck, IA 5th vice-president. . . . Guy Culver, IA 4th vice-president, rejected the application for a charter at Pitcher, Okla. . . . Due to the efforts of Charlie Crickmore, IA representative, the Grand Theatre in Aberdeen, Wash. agreed to operate under union conditions satisfactory to Aberdeen Local 429. . . . Representative Bill Dillon recommended that the General Office grant the plea of Haverhill, Mass. Local 397 for financial assistance. . . . Difficulties developing in the ranks of Local 637, Kingston, N. Y. were reported amicably settled by Harry Sherman, IA representative. . . . Local 321, Tampa, Fla. inserted a notice in the IA Bulletin requesting members of outside affiliated Locals not to come to Tampa seeking work, as many of its own members were unemployed due to a business slump in that city. . . . Road call against the Brandies Theatre in Omaha, Nebr. discontinued. . . . New England District No. 3 held its annual outing at Warwick, R. I. Features of the outing were the baseball games between Providence Locals 23 and 223, won by the latter, and Boston Local 11 vs. Pittsfield Local 275, with Pittsfield the victor. The games were umpired by Harry Sherman, assisted by Dick Green. . . . Bill Lang, manager of the General Office adjustment and claim departments, installed the charter for the newly organized Studio Mechanics Local No. 52, New York City. . . . Local 544, Kokomo, Ind. concluded new agreements calling for a \$5 weekly increase. . . . Representative Raoul assisted Local 519, Mobile, Ala., in obtaining signed agreements.

# Cooling Means for H-I Arc Projection

The candid appraisal in IP recently\* of means for protecting the film from the harmful effects of the intense heat produced by high-intensity carbon arcs induced a flood of comment from the field relative to the efficacy of the various methods cited. To satisfy the widespread demand for further data on this topic, IP presents this unique symposium which reflects the views of leading manufacturers of projection equipment on this most pressing projection problem.

By CLARENCE S. ASHCRAFT

President, C. S. Ashcraft Manufacturing Co.

**T**OTAL elimination of destructive heat transmitted or radiated to the film without light loss is a problem which has challenged the ingenuity of the most experienced arc lamp people in the industry. The fact that a plurality of methods has been the basis of experimentation by lamp manufacturers is at once an indication of the seriousness with which they regard this problem and a good omen of their determination to solve it.

To eliminate the effects of destructive heat on the film there seems to be only one solution at the present time, that is, the interposing of heat-absorbing glass in the light beam. I realize that a loss of light accompanies this, but it seems that new glass of higher light-transmission value is being developed, and it may be that in the near future a much higher percentage of heat may be removed from the light with much less loss of light. Even at the present time with the extremely high brilliancy obtained by the new high-powered, rotating-carbon, reflector arc, the light loss occasioned by the use of heat-absorbing glass is more than offset by the increased illumination obtained from the lamp.

The high efficiency of this new type of lamp is directly attributable to the water-cooling of the positive carbon, permitting higher current densities to be used and resulting in higher intrinsic crater brilliancy, and to the greatly improved optical system employed.

Methods for cooling the projection machine itself and protection for the working parts of the projector must be left to the projector manufacturers. This seems to have been accomplished efficiently by those manufacturers using water-cooling of the aperture or heat shield. I can only speak as a lamp manufacturer.

## *Four Distinct Advantages of Carbon Cooling*

There seems to be some misunderstanding as to the benefits of water-cooling the crater end of the carbon and brush assembly of a projection lamp. I do not believe that any responsible lamp manufacturer would claim that the cooling of the carbon, *in itself* and without increased current, enhances the brilliancy of the crater. There are, however, four distinct advantages in water-cooling of the carbon and brush assembly which, I think, cannot be disputed:

(1) Increased arc steadiness. This is of the utmost importance in the higher current ranges. There is no flicker and a distinct reduction in the erratic flame of the non-

cooled arc. This, of course, results in uniformity of carbon consumption and in screen light steadiness.

(2) Reduction in crater depth. Without water-cooling, at currents above the normal rating of the carbon the crater becomes so deep that the efficiency of the arc is impaired. Water-cooling definitely reduces the crater depth so that higher current densities may be used with a normal and efficient depth of crater.

(3) Reduction in carbon consumption. It seems to be a fact that water-cooling does reduce carbon consumption to a certain extent. This is of importance when higher than normal current densities are used in the carbon, for obvious reasons of economy.

(4) Last, but by no means of least importance, water-cooling almost completely eliminates the heat factor in those parts of the arc lamp adjacent the crater area. For the first time it is now possible to produce high-intensity projection lamps with carbon contacts which need never be removed for cleaning; in fact, the longer they are left without cleaning the better become the contact surfaces. This alone is such a definite improvement over the non-water-cooled projection lamp that it has been praised by every projectionist who has seen it. It is quite a step forward when the projectionist may remove the carbon and retrim the lamp with bare hands without fear of injury.

There is no disposition in responsible manufacturing quarters to minimize either the seriousness or the difficulty of this problem; and I for one would be glad to participate in a symposium under the auspices of the SMPE, as suggested by IP, so that an impartial evaluation of test data assembled by manufacturers could be made.

By J. ROBERT HOFF

Vice-President, The Ballantyne Company

**F**OR the past nine months we have been investigating the matter of cooling projection equipment, but, frankly, the results obtained to date have only served to point up the complexity of this problem. There can be no question, of course, as to the need for some cooling means, as is attested to by every installation using high-amperage carbon arcs.

We are in complete accord with the views expressed in your editorial in the July issue of IP to the effect that the cooling of the lamphouse itself, as a protective measure for the units therein, is only remotely connected with the cooling of the film and of those parts in the area of the aperture. We would say that *both* the lamphouse and the

\* "Monthly Chat," IP for July 1949, p. 3.

projector aperture, if not actually the film itself, must be cooled by some efficient means.

### **Dual Aspect of Problem Recognized**

We have obtained rather good results in cooling the lamphouse, and the carbon therein, by means of air under pressure. This airflow has not disturbed the steadiness of the arc, it prevents pencilling of the positive carbon, and, we think, permits a somewhat larger gas ball and consequent increase in light. We realize, of course, that even should complete success attend our efforts in effectively cooling the lamphouse, there still would remain the very acute, and possibly even more pressing, problem of reducing sharply the amount of heat that strikes the film.

We think it a good thing that this matter be thrown open to full and frank discussion by the various manufacturers in the pages of IP, and we would certainly welcome the opportunity to meet with representatives of other manufacturers to the end that this problem might be licked for the benefit of the entire industry. If such a conference might be arranged, count us in.

By **LARRY W. DAVEE**

Sales Manager, Century Projector Corp.

**T**HERE should be no confusion anent effective means for cooling carbon arc lamps, projectors and the film itself. It would seem that we need to clarify the thinking of those most intimately associated with the equipment industry, including those whose function it is to purchase and maintain projection equipment in the theatre. During the past few years new ideas have been injected into the equipment business, together with a new conception of the responsibilities of the equipment manufacturers.

These new ideas, these new conceptions have the old-timers confused. We need now, more than ever, increased publicity and more frequent open engineering discussions to make these new things as well-known as the older ideas were for so many years.

To begin at the beginning, when something gets too hot we cool it. When heat becomes a problem the most simple expedient is to take it away—a process which involves many sciences. Scientific knowledge plus the many years of first-hand experience most of us have had with projection equipment will lick this problem of excessive heat.

### **Basic Scientific Laws Unchanged by Discussion**

Broadly speaking, there are three primary scientific factors involved in this problem: mechanics, heat and light, each of which is a study in itself and each having its own peculiar characteristics. Heat and light react under known laws which no amount of discussion can change. If these laws were better understood generally, much of the existing confusion would disappear.

Light and sound follow a geometric progression as to their effect on the eye and the ear. As light and sound grow in intensity, it requires increasingly greater increments of level to make the same apparent change in effectiveness. If we listen to a loudspeaker energized by a power of, say, 0.006 watt (zero level), a certain loudness level will be attained. If the power be increased by 0.006 watt (double), the same increased volume of sound will be noticeable to the ear as if a loudspeaker operating at 40 watts were increased to 80 watts. Many people find it in-

conceivable that the same increase in loudness will occur by raising the power output of an amplifier from 0.006 to 0.012 watt as will occur in raising the power from 40 to 80 watts.

I have referred thus to sound and power because it is easier to understand than is light. Following the same basic laws in terms of light, the same degree of effectiveness will be realized by raising screen illumination from 1 footcandle to 2 footcandles as will result from raising the illumination from 50 to 100 footcandles. Doubling the power into a loudspeaker or doubling the amount of light on a motion picture screen results in an effective apparent increase in either sound or light intensity which is just about noticeable.

The presentation by over-anxious salesmen of "facts" which in themselves are unimportant and irrelevant serves only to increase the confusion of those who do not fully understand the basic laws relative to light, heat and sound.

The utilization of water for cooling purposes is well-known in air-conditioning plants. Water will absorb a lot of heat (BTU's)—and fast, acting much like a sponge. When water has absorbed enough heat, it is dumped down the drain along with the heat.

The question of whether to air-cool or to water-cool resolves itself into a simple engineering decision. What is the most efficient means for taking away unwanted heat? Air may be used, but air is inherently inefficient as a heat-absorber and serves only to *transfer* the heat to other metal parts of the mechanism or to the projection room; in other words, it raises the temperature of all surrounding air, metal parts, *etc.*, with which it comes in contact.

### **Advocates Water-Cooling for Both Lamp and Projector**

Water, on the other hand, will absorb a lot of heat without raising the temperature of the surrounding air. By adjusting the time the water stays in contact with the heated part, the amount of heat absorbed can be governed. When the temperature of the water rises to a predetermined amount, it is disposed of and supplanted by fresh, cool water. Neither the surrounding metal parts nor the projection room air are heated at all.

The same cooling system is used in all automobiles. Air-cooling for automobiles has been tried many times, but the extremely high efficiency of water-cooling has rendered it standard automobile engineering practice. Without water-cooling we could not possibly enjoy our modern automobiles.

Water-cooling is simple and effective. It can be used to cool the arc lamp, the metal parts and the projector over-all. When used on *both* the arc lamp and the projector it provides an effective, economical means of supplying the cooling now so urgently needed for these units. I am sure that time will prove water-cooling to be an absolute "must" for modern projection equipment.

By **WILLIAM BORBERG**

Development Engineer, International Projector Corp.

**T**HE article in IP for July opens the way for a much-needed discussion of the problem of cooling projection equipment, particularly with reference to light sources of high brilliance and their effect upon the behavior of the film during projection. Heretofore this problem has been

serious only in the larger theatres and in drive-ins where unusually large screens are used, but the constant improvement in light sources and equipment generally make this topic of industry-wide interest.

It should be borne in mind that the film absorbs, mainly in its emulsion, a part of the energy contained in the light beam. It is this absorbed energy which causes the film to deform or buckle and, at too high a light level, produce blisters or even charred areas in the darkest portions of the photographic image.

Heat-absorbing light filters, arresting a high percentage of the invisible heat rays, are used to good advantage in many installations having high-intensity arcs. The filter has, of course, the disadvantage of a loss of visible or useable light in the order of from 10 to 20%, varying with the type of glass and its thickness; however, it will prevent the excessive absorption of energy by the film emulsion, thus reducing the deformation of the film image exposed in the aperture.

### Excessive Heat Occasions Strong Negative Buckle

This deformation, usually referred to as "buckling," has a direct bearing on the quality of the screen image. A slight buckle toward the light source is tolerable, but a severe curvature of the image from the normal plane will cause an out-of-focus effect on the screen whereby either the screen center is relatively sharp in focus and the outer portions are not, or *vice versa*; or only a poor average focus over-all may be obtained.

A good picture can never be projected with heavily buckled film, since the film in the aperture is never flat during the exposure time and each film frame moves from the normal plane to its maximum buckled position twice. This movement is not instantaneous, it takes time, thus the film is in focus only for a fraction of the time that it is projected on the screen. Such momentary deformation of the film along the optical axis is readily detected by observers with a trained eye, and this might explain IP's reference to "projectionists who insist that they can detect with the naked eye a great improvement in the screen image" after heat filters are installed.

A heat filter, used in connection with equipment currently available, reduces film buckle to an acceptable level and, furthermore, protects the film from permanent injury due to high heat levels, such as lasting buckle or embossing, which renders them inferior for future use, even when projected at comparatively low light levels.

Modern heat-absorbent glass has a useable light transmission of from 85 to 90% and a high rejection rate for light in the infra-red region. The greatly improved screen image and the better preservation of the film itself more than compensates for the relatively small reduction in light on the screen.

### Film Behaviour With and Without Heat Filter

The accompanying chart shows the typical difference in behaviour of film in the aperture under the influence of light and heat, when used either with or without heat filter between the light source and the film. Displacement measurements were made during each revolution of continuously-running loops—one reading at the center of the film and another reading at a point near the edge of the aperture.

The figures show the displacement in reference to the zero deflection point, *i.e.*, a perfectly flat piece of film in the film trap. The light source for both loops was a 175-ampere, high-intensity arc with *F*:2 condensers. A rear-shutter with 53% light transmission was used. The light reduction on the screen due to the filter was 15%.

It should be noted from the curves on the chart that in projection without a filter a considerable difference exists between the points observed and the reference plane, to an extent that even a total reversal takes place after a few runs of the loop, from a negative to a positive buckle. With filter, the displacement of the observation points to each other, and to the zero plane, is considerably reduced, and during the entire run of the loop the buckle remains on the negative side.

The cooling of the carbon jaws by water jackets can hardly have any effect upon the heating or cooling of the film in the aperture, and on this point we are in full accord with the opinion expressed in the IP article.

### Air Blast Directed Upon Film at Aperture

The air-cooling of the film in the aperture has been widely used for about 25 years. European manufacturers adopted this method mainly to promote safety rather than to obtain an increase in the amount of light flux through the film.

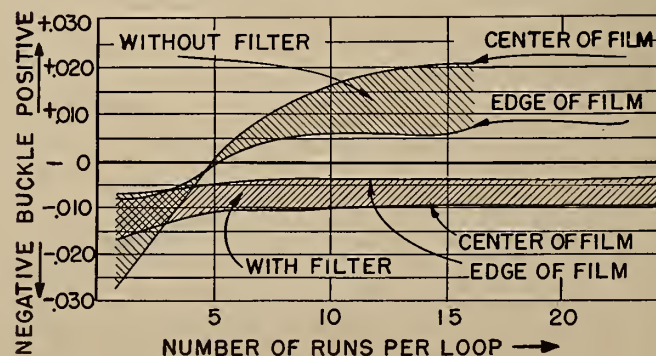
A pistol-range target projector, built about 35 years ago in this country, stopped after the firing of a shot and, in order to determine the marksman's skill, the image was kept stationary for the inspection of the bullet hole on the paper screen. A series of fine holes around the aperture directed a stream of air onto the film emulsion, thus keeping the film cool enough to prevent ignition. The screen illumination did not even approach today's values, nor was picture definition up to the present standard, otherwise these pioneer designers would have had to wait for the recent paper by Dr. F. J. Kolb, of Eastman Kodak Co.\*

Dr. Kolb shows that a dual air-jet arrangement utilizing high-velocity air is necessary to do the job of removing the absorbed heat from the film emulsion and simultaneously directing another stream of air against the film base. This method, according to Dr. Kolb, permits operation with lamps delivering from 50 to 60% more light than is now feasible. The air-jet design must provide a fine bal-

\* "Air-Cooling of Motion Picture Film for Higher Screen Illumination," presented at the Spring 1949 Convention of the SMPTE.

Comparative degree of buckle when film loop is run with and without heat-absorbent glass filters. Buckle figures are in inches.

Drawing by International Projector Corp.



ance between the air pressure on both sides of the film. The emulsion side has to get a good coverage of air to dissipate the heat, while the base must be supported so that the air directed upon the emulsion side cannot cause the film to buckle in a positive direction towards the lens.

Either jet alone will probably be inadequate. The rear jet, on the emulsion side, will remove heat, but its air current may cause film fluttering and a poor screen image. It is reasonable to expect that the front jet alone will have less cooling effect, since the air therefrom contacts the film base only, while absorbed energy from the light is, at the moment of exposure, entirely on the other, emulsion side. Also, the front jet alone will tend to increase the initial negative buckle, due to the heat absorption of the emulsion, unless the cooling effect of this jet is sufficiently large to carry away a major portion of the heat.

#### **'Reduction to Practice' Required for Air-Jet Unit**

Thus, air-jet cooling methods, as outlined by Dr. Kolb, point the way toward further improvement, but they still must be reduced to practice by means of foolproof designs which are simple, reliable and, if possible, quiet. The advantage of such units lies in the fact that there are no light losses, thus higher screen illumination may be accommodated. However, special plumbing, air compressors, air filters and separators may have to be provided.

Water-cooling in the projector has been employed in several European designs. It was used to prevent the heating of the film contacting metal parts in the trap and the gate. A water-cooled aperture will probably act likewise. However, the picture area of the film itself never comes in contact with any units of the film trap, and it is in this picture area where the heating problem is most serious in terms of good picture presentation and film preservation.

It can hardly be assumed that sufficient heat is conducted away from the picture area, laterally, to the outside film edges which are in contact with the cooled metal parts, to prevent buckling. While it is theoretically possible to effect slight pre-cooling of the film by this method, it appears that it will be less effective than either a well-designed heat filter or air-blast cooling of the film.

**By CHARLEY HAHN**

**President, J. E. McAuley Manufacturing Co.**

**H**IGH aperture heat first became a serious problem back in 1929-30 when the first reflector arc lamps using the high-intensity type positive carbon (inadvertently tagged "Hi-Lo") began to be generally used. At that time projector manufacturers made their first contribution to the solution of this problem when they changed the location of the shutter from in front of the projection lens to its present position between the aperture and the light source.

The term "light-heat" used herein refers to the thermal rise which follows the stoppage of all or any portion of the radiant energy produced by a 35-mm projection arc lamp. This thermal rise (heat) increases proportionately with the amount of light that is subtracted from the total light traversing the axis of the projector optical system.

Two methods are presently being advocated as a means to afford light-heat protection for the film: the use of heat-absorbing glass filters which are inserted in the light beam between the aperture and the light source, referred to

herein as the "absorption system," and the heat-radiation method whereby projector parts are either water-cooled or subjected to air blasts from jets which are directed against both the front and the back, or edgewise across each side, of the film at the aperture.

#### **Eliminating Heat Before it Reaches the Film**

We feel that the absorption method is the only one that assures positive results, the only one that is definitely and completely protective, because it actually *extracts* from the light beam that portion of the total heat which is the cause of film damage—*before* this heat reaches the projector and the film. Also, this method results in lower operating temperature of the projector mechanism and in a lower degree of heat absorption by the projection lens.

The use of water-cooled film traps and gates does not in any way reduce the initial temperature impact of the light-heat striking the projector or film. This system can only carry off the higher temperatures that are absorbed by projector mechanism parts, hence its effectiveness in reducing the temperature of the film itself, either before or after exposure, is open to considerable question, because such water-cooled parts contact the film *only on its outer edges*.

Such water-cooling systems present notable installation complications, because a water-circulating means must be provided. In cold weather or in cases where the normal temperature of a water supply is rather low, a moist condensation may accumulate on the cooled projector parts. Humid weather will also promote such condensation.

Water-cooled projector parts (and this applies also to air-cooling) cannot reduce the initial thermal content of the light beam striking the film, thus if a high level of screen illumination is made possible through their use, it naturally follows that the projection lens will reach a proportionately higher operating temperature due to higher heat absorption.

An air stream blowing on the exposed film at the aperture opening is also a heat-radiator, the only difference being that the medium is air instead of water. A compressed air-cooling system also has the complication of a suitable piping system to be installed, as well as equalizing valves to control the jets of air to prevent the bending or bellying of the film at the aperture because of an unequal air pressure.

#### **Possible Mechanical, Maintenance Difficulties Cited**

To maintain an adequate air capacity and pressure, a compressor would have to be powered by at least a 2-h.p. motor. It may have to operate almost continuously, hence there is a sizeable current cost to be considered. Such a system should also have a fairly large expansion tank, so that the compressed air may cool before it is blown on the film. The tank should also have a safety valve. To prevent an excessive accumulation of airborne dirt and moisture in and around the projector mechanism and on the projection lens (which would effect focus), a better than ordinary air filter and drier must be used. Finally, there will be a relatively high maintenance cost, and ever the possibility of oily mist accumulating on parts adjacent to the air jets because of oil leakage from the compressor cylinders, pistons or rotors, as they become worn.

If a motor-driven centrifugal blower or a rotary air

pump be used for the air supply, instead of a compressor, adequate filtration of airborne dust and moisture becomes a more difficult problem, because such a source cannot build up the necessary pressure to force the air through efficient air-filtering mediums. The ever-present collection of dirt and oily smudge that is seen around air vents of exhaust fans, ventilating and air-conditioning systems, *etc.*, is evidence of this, and it is logical to assume that such accumulations of dirt will likewise occur in the projector mechanism.

Possible mechanical failure of motors, compressors, blowers, air pump; replacements of filters and maintenance all contribute to a high cost of operation.

### **Air-Cooling Induces In-and-Out-of-Focus Effect**

We all know that as film passes through the projector, the sprockets, guide rollers, film tracks, tension shoes, *etc.*, only come in contact with it for a width approximately equal to the width of the sprocket hole area on each edge; also, that a centre clearance area is provided for each face of the film to prevent scratches and damage to the emulsion and plain side of the photo frame area.

In our original work with air-cooling systems, we found that when only slightly warped film was used, any air draft of sufficient volume to do any radiating of heat at all would cause a higher rate of in-and-out-of-focus fluttering, at the aperture, than is normally experienced when no air draft was used, and that such fluttering tendency was markedly increased when the air was directed across both sides of the film from an edgewise position.

It is erroneous to assume that just because aperture air-cooling made practical in great measure the present method of process background projection in the studios, it will likewise solve the problem of aperture heat for theatre projection: the projection principles involved are wholly different and unrelated.

### **Simplicity, Efficiency of Absorption Method Cited**

The absorption system, on the other hand, is extremely simple and definitely effective. It entails no high installation cost, no operating complications, and no high operating cost. An absorption heat filter requires only a 1/50-h.p. motor to operate the blower which cools the filter glasses, and this motor runs only when a particular projector is operating.

Widely circulated is the wholly erroneous impression that the use of a glass heat filter will result in a 20% loss of visible light. This round percentage figure undoubtedly originated (and would more or less correctly

apply) to the first internally-colored heat-filter glass to become commercially available, the Aklo Nos. 395 and 3966 glass having a thickness of 2 mm. Here it should be emphasized that a light-transmission curve will vary materially *depending upon the thickness of the glass used.*

For example, the aforementioned Aklo No. 3966 glass, having a thickness of 2 mm, is known to have an optimum heat-absorption ratio of 70% and an optimum visible ray-transmission ratio of 80%—a light loss of 20%. But we have always used a glass of only 1½ mm thickness which transmitted 84% of the light. Now comes the newly-developed phosphate-type glass which in 1½ mm thickness passes 86% of the visible light rays!

### **Number of Glass Strips Used is Elective**

A complete filter glass unit consists of a metal frame with provision to hold a total of eight strips of glass. The two outer strips, in inches, are ¾ x 3, while the other six strips are each ½ x 4. All these strips are only 1½ mm thick. The strips are removable, thus only as many need be used in the light beam as are required to prevent film damage at the particular current drawn by the arc.

With the entire eight strips in use, the average total visible screen illumination loss is at most 14%. When only three or four strips are required to prevent damage, this light loss can be reduced to approximately 7 or 8%, a practice that is utilized by many installations using 170 amperes at the arc. The removal of porthole glass compensates almost entirely for the visible light loss occasioned by the filter glass.

It would seem that too little attention has been paid to the possibility of pre-cooling the film before it is exposed to the heat at the aperture, that is, at some point within the projector mechanism between the upper magazine fire trap and the aperture, or between the upper magazine and the top of the projector mechanism.

Such a method is entirely feasible, either by means of an air-cooled chamber through which the film would travel or by cooled air which could be blown directly against the film. A very small mechanical refrigerating unit could be so designed that the degree of pre-cooling could be definitely controlled, manually or automatically by a thermostat. The radiation of heat while the film is being rewound, or the provision of cooled storage compartments, are other possibilities.

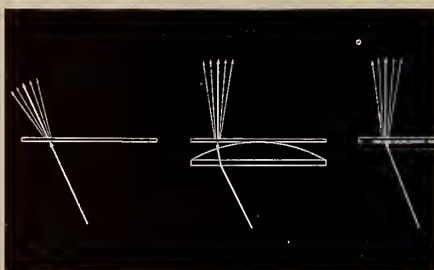
It seems pertinent to mention here that irrespective of the type of high-intensity lamp used, or the carbon trim used, or the arc amperage, it is authoritatively conceded that with the present average range of photographic density

## **Kodak's New Ektalite Lens**

Kodak's Ektalite field lens is something new in photographic equipment. It's being used in the new Kodak Reflex II camera and in the Kodaslide Table Viewer. For a clear understanding of how this lens works, look at the accompanying three sketches.

The usual twin-lens camera has a viewing lens that transmits the subject image to a mirror, which reflects it to the ground glass screen. The light rays (as shown by the figure at the left) tend to go in straight lines through the screen. But the image loses brightness, except in the very center of the screen.

Now notice the center diagram. It shows a condenser-type field lens below the screen. This bends the light rays upright and fun-



Comparative quality of Ektalite lens.

nels them directly to one's eyes. But this type is relatively heavy, bulky and often causes fuzzy images. In short, it's not very practical.

The sketch at the right reveals what the Ektalite lens achieves. It does what the condenser lens did without the condenser's optical drawbacks.

A series of precise grooves—200 to an inch—on the face of the lens “reproduce” the over-all curve of the condenser lens surface. Thus the condenser lens, in effect, has been “flattened” into a thin plastic sheet. Placed below the ground glass in the camera, the Ektalite lens does the job of a standard condenser lens nine times as heavy and 20 times as thick!

the absolute top level of screen illumination it is safe to use is 16,000 lumens. This refers to measurement without film in the projector, without shutter losses, without port glass losses, and with an efficient and accurately aligned optical system.

It seems perfectly clear, therefore, that without some means of light-heat protection for the film, the mere use of a certain type of carbon combination having a stated maximum screen lumen output at a certain amperage, in a lamp having a particular diameter reflector and *F* light speed—all this is no indication that a level of screen illumination higher than 16,000 lumens will be obtained. If a higher level of screen light actually did result therefrom, film damage in varying degree would be experienced at some time or other, or possibly all the time.

The foregoing comment should not be construed as a criticism of any particular manufacturer's product; rather is it a summary, as the writer sees it, of ten years' experience with this particular problem.

By H. T. MATTHEWS  
President, Motiograph, Inc.

THE ADVENT of the drive-in theatre with its tremendous screen area has intensified the search for greater light-producing capacity from projection equipment. With existing limitations on the efficiency of shutters of all present types, efforts have been devoted in the main to increas-

ing the output of the light source. Since increased light means increased heat on the projector and the film, the problem is complicated by the need for providing effective means for cooling.

First, let us not confuse water-cooled positive contacts in the lamphouse with film-cooling or, for that matter, with known means for improving light production. Though claims for improved light with this method have been made, they are contrary to laboratory findings (except under special conditions), and no one has yet demonstrated just how such claimed increase is achieved.

Water-cooling the lamphouse may have beneficial effects with respect to increasing the life of contact parts in some makes of lamps, making lamp parts cooler to handle and, possibly, decreasing carbon consumption; but our tests here at Motiograph have not progressed sufficiently to enable us to substantiate any claims regarding light output.

In any event, the heat on the aperture and the film is radiated from the lamphouse mirror or condenser, as the case may be, and the cooling of the carbon jaws cannot possibly affect this situation—unless, of course, it should be found that water-cooling at this point actually reduces the amount of light produced.

#### *Cites 80-Ampere Level as Threshold of Danger*

Any carbon arc lamp operating at 80 or more amperes gets into the range where heat becomes a problem. The use of filters to reduce this heat has been tried with some

(Continued on page 34)

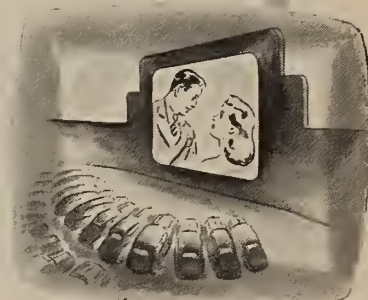
## Giant "Drive-In" Images

with

### Edge-to-Edge Sharpness



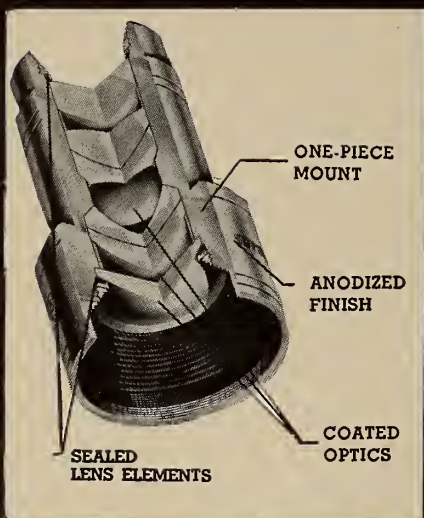
● For the toughest projection job . . . producing clear, critically defined, uniformly brilliant giant images on "Drive-In" Theatre screens . . . Bausch & Lomb Super Cinephor lenses are preferred. Only screen images easy to look at with edge-to-edge sharpness satisfy theatregoers. Be sure *your* screen images are the best . . . specify Bausch & Lomb Super Cinephor projection lenses. Bausch & Lomb Optical Co., 616-I St. Paul St., Rochester 2, N.Y.



FOR TOP IMAGE QUALITY ON YOUR SCREEN . . . THE  TRADEMARK ON YOUR LENS

BAUSCH & LOMB *Super Cinephor* PROJECTION LENSES

# f/1.9 SUPER-SNAPLITE



## Question Box

No. 8

### WHY ARE SHORT FOCAL LENGTH LENSES USED FOR DRIVE-INS?

Where the projection room must be located near the screen, short focal length lenses are necessary to project large pictures. For this reason lenses with focal lengths from 2" to 3½" are usually used in Drive-Ins. The Kollmorgen Screen Chart shows the focal length needed for pictures from 9 to 85 ft. wide at 40 to 400 ft. throws.

### DO SHORT FOCAL LENGTH LENSES GIVE HIGH QUALITY PICTURES?

Short focal length lenses for wide angle projection are quite difficult to design, but special attention was given to this phase in computing the Super-Snaplites.

### DOES THE PICTURE PROJECTED BY A SUPER-SNAPLITE HAVE THE SAME QUALITIES IN ALL FOCAL LENGTHS?

Yes. Due to the unique design of the Super-Snaplite, the picture projected by a 2" lens shows as good definition, flatness of field and uniformity of light as with the more popular sizes such as 4" or 4½".

### ARE THE SIZES OF THE VARIOUS ELEMENTS THE SAME FOR ALL FOCAL LENGTHS?

No—the elements are designed for each focal length and vary in size.

### WHAT IS THE TOLERANCE IN FOCAL LENGTHS OF SNAPLITES?

Snaplite lenses are all within the tolerance of plus or minus 1% recommended by the Society of Motion Picture Engineers.

### IN ACTUAL PRACTICE WHAT DOES THIS PLUS OR MINUS 1% MEAN?



It means that the actual picture size for any focal length lens will be within plus or minus 1% of the computed picture size. Thus if a 20 ft. (240") wide picture is desired, the actual projected picture might be 238" or 242" and still fall within the accepted tolerances.

"You Get the Most Uniform Light with Super-Snaplite"

## KOLLMORGEN

2 Franklin Avenue  
Brooklyn 11, New York

Optical



CORPORATION

## LENS AND FILM FACTORS

(Continued from page 8)

gate, may be such that a perfect focus is a physical impossibility.

The function of the film gate is simply to hold the film in correct lateral alignment and perfectly flat and motionless while each individual frame is projected. If the gate fails to hold the film-photograph flat and *square to the lens*, the definition of the projected image will be poor. Yet many times the lens is blamed for out-of-focus effects which are really due to failure of the gate to perform its simple function.

The effects produced by worn gate runners (film trap shoes) are frequently very pronounced, making it impossible to secure a uniformly sharp focus on all areas of the screen, even with the best of lenses. Sometimes the left- and right-hand sides of the screen differ in focus, and very often one corner (usually the lower right-hand corner of the screen image) is blurred when all other parts of the picture are perfectly sharp. The following test serves to determine whether the lens or the film gate is at fault when only one part of the picture is blurred:

Project a reel of pictures known to have good definition. While the reel is running, loosen the lens holder and rotate the lens barrel a quarter of a revolution or more. Refocus and note the image definition. If the blurred area has shifted to another side or corner of the screen, something is wrong with the lens.

If, on the contrary, the blurred portion of the picture *remains in the same region of the screen* no matter how the lens is turned, the film runners (trap shoes) are worn and need replacement.

Periodic testing of the flatness of the film trap shoes with a short steel straight-edge is good practice, but it does not compare with the aforementioned actual projection test for tracking down poor image definition arising from hollow-worn shoes. Shoes, or runners, must also be replaced if the film has grooved them longitudinally. (Draw a sharp-edged copper coin across the shoes laterally. The tell-tale "click" indicates grooving. Detection of grooving is more difficult in the case of Simplex E-7.)

Uneven hollowing of the film shoes may be traced to worn and incorrectly adjusted gate tension pads (film trap-door pads).

Image definition, even though limited by the quality of the lens and the print, is largely a matter of projection practice. The attainment of the most perfect definition which the print allows is one of the most valuable contributions the projection craft can make to the continued success of professional movies.

## TELECASTS

(Continued from page 15)

mixture is broken down into the three primary signals carrying the different colors. These then are fed simultaneously onto a screen to give the single, full-color picture.

The CBS mechanical system uses the sequential method of transmission—sending the picture first in one color and then in another, the eye's persistence of vision giving the finished image.

Noting that the receiver market already was subject to severe price-cutting, dealers expressed the fear that the public might believe that color would be here almost immediately and hesitate to buy receivers. This viewpoint was buttressed by a statement by Emerson Radio Corp., which holds that there is a "remote possibility" that color Tv receivers will be available to the public by 1953. "It would now cost anywhere from \$300 to \$500 to build a converter to receive color—that is, to build them on a mass-production basis and not handmade lab units. A set to receive *both* color and b-and-w should sell for about \$1000."

This color Tv situation, if it slows up materially the sale of receivers, might give the motion picture industry a much-needed breathing spell until it gets its own Tv and other technical programs in order; but if home Tv proves to have the wide audience appeal that some quarters attribute to it, the respite will be in any event of brief duration.

### Altec's New Quality Tv Receiver

Newest entry into the high-quality television market is Altec Lansing Corp.,

### Correction, Please

In the August issue of IP (p. 28) there appeared a picture of Ray Colvin, secretary of TEDPA, accompanied by a caption which described him as Roy Boomer,



Roy Boomer  
Sec.-Treas. of  
TESMA. This  
photo warranted  
authentic.

whose likeness is reproduced herewith. Both handsome guys and both devoted to the big equipment show staged jointly by their respective organizations each year (this time in Chicago Sept. 26-28). Excuse it, please.

long recognized as specialists in the professional sound reproduction field, notably the motion picture industry.

Bringing their 20-year professional know-how in relating sound to sight in both the production and theatre phases of motion pictures, Altec Lansing asserts it has brought to Tv for the first time a quality of sound reproduction commensurate with the most advanced design on the visual side, stressing that it has deliberately aimed at the "high end of the high-quality market" and will not "mass-produce for the hot-dog market." The new receivers are in production in Altec Lansing's own factory in California on a

strictly limited production schedule of only 200 a month.

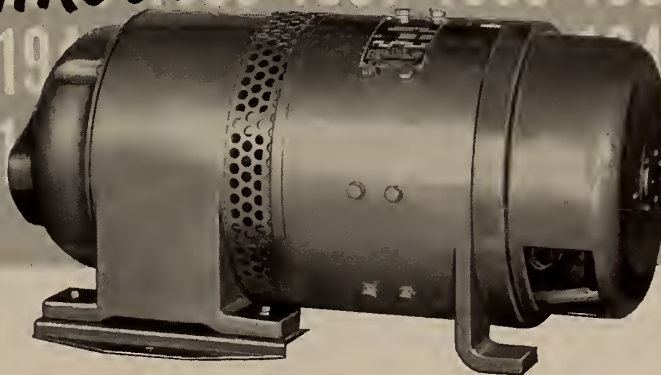
Featured specifications include as "a new and unique" easy-turning channel selector to provide for positive station tuning, an exclusive video circuit design which improves picture quality by 40%, a 12½-inch picture tube, and an 8-inch 400B Dia-Cone speaker which produces audio quality superior to that of competitive receivers costing more than \$2,000.

Table and console models are furnished in mahogany, walnut or blonde finish. Selling prices are \$367, \$408, and \$308 for table, console, and chassis, respectively.

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A General Precision Equipment Corporation Subsidiary  
**MOTORS • MOTOR-GENERATORS • GENERATOR SETS**

## NEW 16-MM LENS SERIES

(Continued from page 17)

and with no shutter or film in the gate, theoretically it should be possible to deliver approximately 605 lumens to the screen. Assuming a shutter efficiency of 50%, this would reduce to 302 lumens. The previously mentioned ASA specification requires under the same conditions 275 lumens with 65% average corner-to-center distribution. A Navy specification requires the same lumen out-

put, but with 75% average corner-to-center distribution.

Obviously, then, in order to reach the required total lumen output, practically all of the F:1.6 speed of the entire system must be utilized. Inherently, any lens, as is well known, will transmit less light the farther off the axis we go. In the case of the 2-inch Super Cinephor 16, which will vignette the most since it is the shortest focal length in the series, there is about a 30% loss of light in the extreme corner of the 16-mm frame.

A Petzval-type lens, because of its simpler construction, vignettes under the same conditions anywhere between 20 and 30%, depending on the lens and whether or not it has a field-flattening element. Therefore, the requirement of 75% corner-to-center uniformity demands not only a 100% efficient condenser, but actually in most cases a deliberate reduction of light in the center of the field.

This can be done in the condenser design, but obviously it will reduce the total lumen output and, as already stated, there is practically no room to move in this direction. Therefore, even at best to meet the illumination requirements as aforementioned, it requires a very delicate balance between total output and uniformity.

### 65% Center-to-Side Distribution

Coupled with the fact that it is almost impossible to design a perfect condenser, and with the many other variables in the system such as variation in light sources and misalignment of the optical system, it is felt that the aforementioned specifications are not realistic for practical projector performance.

However, under carefully controlled conditions, and with a well-designed condenser, 65% corner-to-center uniformity with approximately 550 total lumens (with no shutter) can be achieved with an F:1.6 Super Cinephor 16 lens, and a 750-watt, 25-hour lamp. This represents about the limits that can be obtained without resorting to faster lenses or different light sources.

Finally, in keeping with the design requirements of projection lenses, so

(Continued at foot of next page)

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We are proud of our 23 years of service as "Silent Partners" to the projectionists of America.

You put the show on!

We help you keep it on—maintain

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A more brilliant, steadier, more consistent white light—more economically . . . proven facts as shown by tests made under actually operating conditions.

Lorraine Carbons are world renowned . . . the largest theatres in the U. S. and throughout the world use Lorraine Carbons.

\*Featured in our horizontal-feed copper-coated carbons.

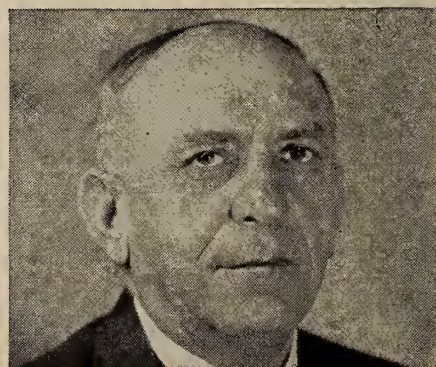
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**SAM SCHWARTZ**—Owner, Aztec and Yolanda Theatres, Eagle Pass, Texas—declares:

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To get the benefits of RCA Service—write: **RCA SERVICE COMPANY, INC.**, Radio Corporation of America, Camden, N. J.

## All This, and the Movies Too: Drive-Ins as Seen by 'Time'

Copyright 1949 by Time Magazine

Within the year, U. S. drive-in theatres had doubled: more than 1,000 sprawled under the sky in 45 states, and, with at least 100 more on the way, the sky seemed to be the limit. While indoor exhibitors gloom over a 20% drop from last year's box-office take, *Variety* reported a 10% boost in drive-in business.

Drive-ins . . . and "airers," could also point to a recent triumph over man and nature. In Denver recently, a once skeptical Hollywood had staged its first world premiere at an ozoner. Heavy rain lashed at the arena, but to see a Western 7,000 of the faithful waited for two hours in 1500 cars.

### Barbecue, Bingo—and Movies

From their modest start in Camden (N.J.) in 1933, the drive-ins have grown too big to be dampened by rain. They woo the family trade with an imposing sideshow of picnic areas, merry-go-rounds, dance floors, shuffleboard courts and bottle-warming, car-washing and laundry service. Among the latest gimmicks, planned or already drawing customers to the airers: nightclubs, golf-driving ranges, Shetland ponies, barbecue pits and motorized bingo (the jackpot goes to the right speedometer mileage).

All this, plus the movies, takes as big an investment as a regular cinemansion: one 2,000-car ozoner near Cincinnati cost \$750,000. But the payoff is heavy and swift. Example: the atmosphere under artificial moon-glow whets appetites so keenly that popcorn, hotdogs and hamburgers sell about four times as well at ozoners as in theatres. Some drive-ins can pay all expenses with the receipts from munching.

### New Moviegoers Bulk of Audience?

One outdoor impresario estimates that 80% of drive-in fans are not, and never have been, regular indoor moviegoers. The best customers are (1) moderate-income families who bring the children to save on baby-sitting (2) the aged and physically handicapped and (3) farmers and factory workers ducking the ritual of dressing up to go to a movie in town. The drive-ins are also popular with young neckers, but exhibitors deny that their places are, in *Variety's* phrase, "passion pits with pix." Their righteous de-

fense: nothing happens that doesn't go on in a balcony.

Most ozoners get by nicely with old movies, but many are clamoring for a chance to show the latest pictures: four Illinois drive-ins are suing for earlier showings. Another growing pain: at least three state legislatures are talking about regulating or taxing the drive-ins, and some local officials have banned them as road hazards because they disgorge hundreds of cars at once.

### Owners' Resourcefulness Overcomes Handicaps

The battle against the elements is progressing. Airers have found a glycerine compound which is sprayed on windshields to drain off the downpour in transparent sheets

instead of dribblets. Steel reinforcement keeps 60-by-50 feet screens from toppling in high winds. For mosquitoes, there are DDT foggings. Against fog, filters have been devised to help projectors lay the picture on the screen clearly and sharply.

### Hot or Cold—on Order

Though the weather holds most ozoners down to a 30-week season, except in such places as California and Florida, some install portable electric heaters in each car. This season an engineer has stepped forward with the last word—an air-conditioning scheme that will keep the cars not only cozy against wintry blasts but cool and dry in the August heat.

## What projectionists say about the ASHCRAFT SUPERHIGH LAMPS

"They're honies . . ."

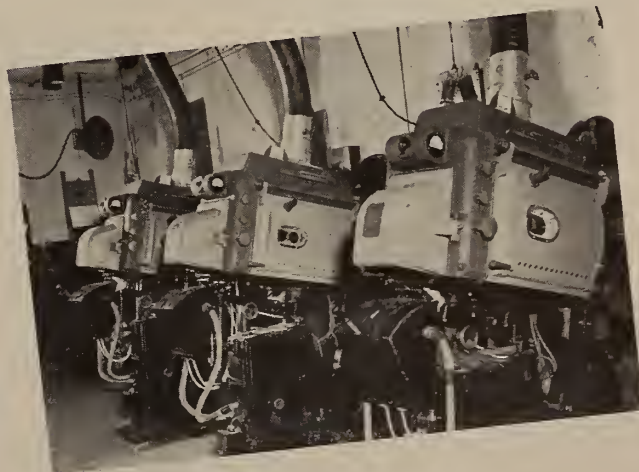
"Once we light the lamps they take care of themselves."

"The lamps are the projectionist's dream."

"We trim the lamps with our bare hands . . . no tools."

"We have yet to see the individual who does not like the lamp."

TRULY THE PROJECTIONISTS' PROJECTION LAMP



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### NEW 16-MM LENS SERIES

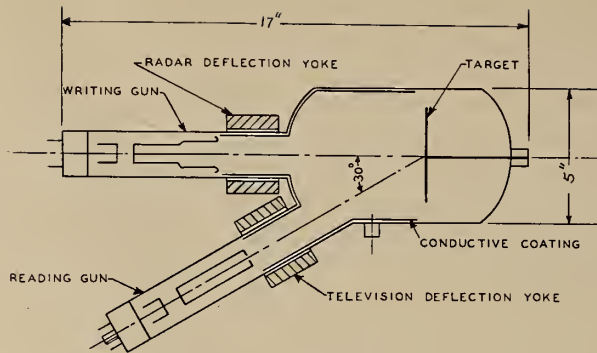
that they be in every way comparable to larger lenses, the Super Cinephor 16's are held in manufacturing to a focal length tolerance of  $\pm 1\%$ . This eliminates the necessity of matching when the lenses are used in pairs in the usual manner in continuous projection.

[The author acknowledges those who did most of the actual optical and mechanical design referred to in this article namely, the late Dr. W. B. Rayton, Miss Lena M. Hudson, Dr. K. Pestrecov, Mr. C. DeGrave, and Mr. D. Gottschalk.]

## New Graphecon 'Memory' Tube

Evidence of the onward rush of electronic development is a new electron tube, introducing a material that is used both as an electrical conductor and an insulator, in which the fleeting image from a radar scope can be *retained and intensified*. The tube, developed by RCA, is a "booster" device that is employed between the stage where the radar beam is received and where it is reproduced on a Tv kinescope. It has "visual memory," retaining for more than a minute images that otherwise would have a life of less than 1/millionth second.

The heart of the Graphecon is a metal target, 3 inches square, coated on one side with a layer of pure quartz 20/millionths inch thick. Two beams in the legs of a V-shaped tube are aimed at this target: one is the radar beam, which "writes" on the quartz surface; the other is the Iconoscope-type beam—such as is used in a Tv camera



—which "reads" from it. Unlike a fluorescent screen, the target is not light-sensitive, but is sensitive to electrical charges.

### Action of the 'Reading' Gun

The beam of electrons from the "reading" gun strikes the target and every electron knocks off secondary electrons, which fly to

the conducting coating that lines the tube. Removal of negative electrons builds an increasing positive charge on the target surface, until a maximum point of equilibrium is reached. When this occurs, the excess of secondary electrons, over the beam current, returns to the target, maintaining the electrical *status quo*. At this point the quartz coating is acting as an insulator and permits the charging of the surface to a higher voltage than the metal sheet.

At this point the Iconoscope beam has prepared the target for the radar beam, which will "write" on it. When the radar receiver picks up a reflection, the signal turns on the radar beam of electrons which crashes through the quartz layer, makes it conducting at that point and there discharges the voltage.

The Iconoscope scanning beam then knocks secondary electrons from that spot on the target in an effort to bring it back to equilibrium. This removal of the electrons produces a signal on the target which is amplified and applied to the kinescope. The Iconoscope scans 30 times a second and can take as long as 2000 scans to bring the signal area of the target back to equilibrium—or read off the signal completely. Thus the image may be retained for approximately a minute.

On the other hand, the radar antenna revolves once every five seconds and repeats each signal at that interval. By coordinating the reading speed of the Iconoscope with the writing speed of the radar beam, all the signals may be seen on the kinescope with a high level of brightness.



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The Academy of Motion Picture Arts & Sciences recognized the value of this development in making its 1947 award to C. C. Davis of the Western Electric Co.

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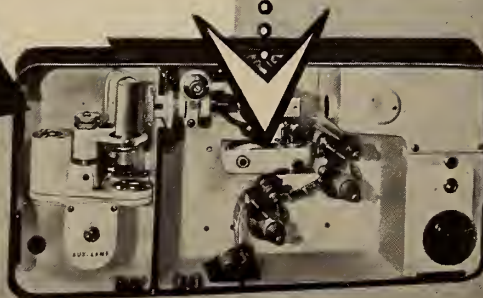
The Award-winning Hydro Flutter Suppressor as used in the new Century sound reproducer.



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Century Sound Reproducer

### Trust-Buster Hits Producer-Exhibs

If no producer were permitted to profit from theatre operation, the number of features marketed would zoom, former trust-buster Thurman Arnold told the House Judiciary Committee recently. "The trouble is . . . that they put out only from 300 to 400 films a year and not enough for all the little theatres that are desperately going broke for want of pictures and setting elaborate schemes as to who gets this short supply," said Arnold.

Thousands of films would profitably be turned out, he ventured, if no producer were permitted to hold any financial interest in theatres. "Why should a producer make a lot of pictures for his competitors?" he concluded. "It can make more money out of that set-up by reducing the supply."

## NEWS PROJECTIONS

*Jottings of happenings which, while mostly of a non-technical nature, have a bearing upon general industry welfare and progress.*

**S**ETTLED policy of both AF of L and the CIO to bear down on seniority protection and pension-welfare plans in lieu of wage increases is expected to be reflected in future film industry bargaining. . . . 20th-Fox and Warners still wrestling with Dept. of Justice about theatre divestiture formula. . . . Congressional leaders adamant in refusing to accede to flood of requests for repeal or reduction in 20% ticket tax. . . . FCC shows no sign of relenting in its tough attitude toward application for Tv licenses from film companies hit by anti-trust decrees.

By the end of 1950 A. T. & T. Tv network will cover 43 cities. Company told the FCC that experiments have demonstrated that both coaxial cable and radio relay can transmit color Tv. . . . Western Union wants in on the Tv picture via its relay equipment now being used for telegraphic messages. W. U. qualifies as a "common carrier" under the communications law. . . . FCC ban of all giveaways on the radio networks cheered theatre interests. Broadcasters will fight ban in courts. . . . Deny it or not, fact is that distribs have slashed number of release prints over the country. Bum prints the inevitable result, especially since little time is afforded for interim inspection. . . . Kicks against non-advertised reissue films mounting all over the country. Moviegoer doesn't find out the score until he's paid his dough and sat thru a reel or so.

Columbia will release 67 films next season, including 31 "top" production, 22 "features" (how much off from the "top" is not stated) and about 15 westerns. . . . Distributors fear theatres will be drawn into a giveaway rat race as an antidote to mild b.o. fare and competition from other amusements. Premiums more widespread than ever.

. . . American film circles still dazed by savage attack by Tom O'Brien, British Labor leader and M.P., on the "almighty dollar mentality of America" and the 'unlettered, potbellied money magnates of the U.S.' O'Brien attended the I.A. convention in 1948.

Rev. Patrick Masterson, executive secretary of Catholic Legion of Decency, says pictures are at an all-time moral low. The padre's chief blasts were at foreign imports. . . . Shooting time on Hollywood sets has been cut 25%, reports the *Wall Street Journal*. Pre-shooting preparation is said to be main factor in cut. . . . Warner Bros. backlog of completed films now total 59. . . . More and more American producers getting set for foreign production in order to siphon off blocked funds. Tough on Hollywood technicians. . . . Technicolor, facing an anti-trust suit, offers to license any other company on "appropriate terms." . . . All-industry conference on public relations in Chicago on Sept. 1 developed into a love feast.

Altec-Lansing entry in Tv receiver field strictly a tailor-made proposition. . . . Paramount earnings for second 1949 quarter ending July 2 were \$7,800,000 as compared with \$5,810,000 for like period last year. Special non-recurring 1949 income of \$4,500,000 arose chiefly from sale of theatres and other joint interests as required by the consent decree.

Definitely new is the new plan to extend credit to moviegoers in heavily industrialized areas which have been hit by strikes. Books containing 40 exchange tickets are issued upon submission of an auto driver's license, a car owner's registration or a Social Security card. No checkups will be made, no bills issued, the patron being expected to pay as soon as possible at regular box office scales. The theatre will advance the Federal tax on each "charge it" admission. . . . The anti-trust decree forcing the divestiture of many chain theatres will "open up" towns heretofore closed to any but producer-distributor houses.



**HARRY L. NACE, SR.**—President, Harry L. Nace Theatres, Inc., Phoenix, Arizona—says:

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## Du Pont's New Polymer Color Release Positive Film

**P**RODUCTION of a release positive color film replacing gelatin with a superior synthetic polymer has been announced by Du Pont. The film is suitable for making color prints in the professional motion picture field. It is designed to be printed from three black-and-white separation negatives and to be developed in color during a single passage through a slightly modified conventional developing machine.

The film consists of three emulsion layers superimposed on one side of standard ciné film base. The binder for each layer is a polymer which behaves also as a dye intermediate capable of forming

a dye image under the control of a developing silver image, according to the well-known method of color-forming development.

### Procedural Changes Effectuated

In the past, the emulsion layers for color-forming development have contained at least three components—gelatin, silver halide, and color-former. In the printing film worked out by Du Pont, only two components are employed—silver halide and a water-sensitive synthetic polymer which plays the role of both gelatin and color-former.

Heretofore, it has been considered that a slightly solubility of the color-former in water was essential in order to bring about the dye-coupling reaction and that the migration of a soluble color former had to be prevented by various means.

In the new conception developed by Du Pont, there are no problems of migration or solubility. The color-former is as insoluble as gelatin. Water only swells it. When the polymer is swollen by processing solutions, the color-forming groups, though bound up in a complex polymer molecule, remain highly reactive with the oxidation product of the developer.

### Layer Arrangement in New Film

The layer arrangement in Du Pont color print stock departs from the order usually used by monopack producers. It is as follows:

Blue-sensitive	
emulsion .....	magenta polymer
Red-sensitive	
emulsion .....	cyan
Green-sensitive	
emulsion .....	yellow
Support	

This arrangement is permissible because the printing is done on a registration printer and any one of the three separation negatives can be directed into the appropriate layer by the proper selection of printing light. The particular

arrangement aforementioned permits optimum quality in that the most important records from the standpoint of definition are placed in the top layers, and the yellow, least important, is placed in the bottom layer where diffusion effects caused by printing through the two emulsion layers are least noticeable.

The layer arrangement invites the use of a dye sound track and a blue-sensitive photocell for reproducing sound. A track in magenta, which gives good response to a blue cell, can be confined to the outer layer to get the advantage of sharp definition. But since blue cells are not a part of present theatre equipment, a silver-plus dye track is recommended. This can be obtained by several known methods, such as preventing the bleaching of the sound area or by redeveloping or sulfiding the track after bleach.

The polymer film, although yielding acceptable results with separation negatives made from a color original, will give maximum quality with black-and-white separations made in a split-beam beam camera or by other means capable of giving black-and-white originals.

### Clarity in Circuit Diagrams

With the increasing use of electronic apparatus in industry and engineering, symbols which were originally only intelligible to the radio circuit designer are now appearing in all the technical journals, and engineers find that their present-day knowledge has to include an ability to read the complexities of an electronic-circuit diagram.

This task is not made easier when the circuit diagram takes on a variety of forms and contains an assortment of symbols which differ sometimes from page to page in a given publication. It is unfortunate that



IKE BERNEY, Owner, and son IRV BERNEY, Manager—Pastime Theatre, Lewiston, Pa.—say:

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these symbols differ even between branches of the same profession.

For example, the power engineer's transformer, sometimes represented by a pair of wavy lines, becomes the radio engineer's resistance. The non-inductive resistance in electronic diagrams is commonly used for an ordinary resistance in power circuits.

To add to the difficulties of reading, some circuits are drawn in such a manner that only an expert, with a pencil laboriously tracing over the lines, can determine the function of each component. His work is made still harder if unfamiliar outlines are used to identify familiar components.

As was stated in a recent article: "The object of a circuit diagram is the explanation of the operation of a given circuit, and any attempt to make the diagram fulfil the additional role of a wiring diagram usually results in obscuring the electrical operation of the circuit."

The use of graphical symbols familiar to all and accepted as standard will obviously simplify the task of reading a complex circuit. The introduction of universal electrical graphical and letter symbols is an important step toward that standardization to which we all pay lip-service but seldom encourage.—ELECTRONIC ENGINEERING.

### Soldering a Wire to a Crystal

How would you solder a wire to a crystal? This must be done for most of those wafer-thin plates of quartz used in electrical circuits. They play a big part in the myriad-channel telephone system that utilizes coaxial cables.

This is how Bell Labs solved the problem: a spot of paste containing silver is deposited on the crystal and bonded to it by oven heat. The crystal is then vapor-plated with a thin layer of silver. Then a fine wire is soldered to the spot by a concentrated blast of hot air. The result is a rugged electrical connection to the surface of the crystal which

does not interfere with its vibrations.

Sealed in glass tubes, the crystals are precise and reliable performers in communications. Each is a crystal gate to a voiceway, separating your conversation from the hundreds of others which may be using a pair of coaxial conductors, at the same time.

### Projection Optics Reorganization

The reorganization of Projection Optics Co., of Rochester, N. Y., is now complete, according to an announcement by Fred E. Aufhauser, president. Francis J. Fouquet is vice-president in charge of manufacturing. Present plans of the company include a widening and improvement of service and an addition to the Superlite series of lenses.

## BOOK REVIEW

**THE COMPLETE PROJECTIONIST**, by Howard Cricks, F.B.K.S., F.R.P.S. Fourth edition, edited by Alex J. Martin. 374 pages, more than 200 illustrations, 3 blueprints and index. Blue leather cloth. Odhams Press, Ltd., 6 Catherine St., London, W.C. 2. 10/- (approx. \$2.50 U.S.).

This work produced in England, is a general handbook for projectionists. The 33 chapters cover every conceivable phase of projection theory and practice in a comprehensive, well-balanced manner. Television and experimental developments are given a proportionate share of space, and the numerous tables, charts, and projection rules and regulations (British) are only a few features which make this book a giveaway at its modest price.

Mr. Cricks, technical editor of *Ideal Kinema* (London) and not unknown to readers of IP, has produced a compendium which should commend itself highly to projectionists everywhere. Concise and lucid, this book is eminently practical and informative; and apart from a few points on which we differ with the author (the handling of film fires and the cleaning of lenses, for example), the work is technically accurate and wholly trustworthy. The concise presentation of basic optical, acoustic and electrical principles set a standard for projection texts.

There is a remarkably good exposition of the high-intensity arc, and the treatment of the value of the arc voltage (not generator or rectifier voltage) as an indicator of arc

stability is thought-stimulating. Also accorded first-rate treatment are projection room appointments, oil and gas engines, studio process projection, stereophony, stereoscopy, color films, and 16-mm projection. The section on sound is fully abreast of latest developments. The book is beautifully printed and illustrated.

The understandable preoccupation with British equipments and practice does not limit the usefulness of this hook, and comparisons made to evaluate the worth of this volume need not be confined to the European field. Indeed, those American projectionists who have found considerable fault with the unwieldy and error-saturated American manuals on the art will find "The Complete Projectionist" a long-sought medium. Highly recommended.—R.A.M.

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## COOLING MEANS FOR H-I ARC PROJECTION

(Continued from page 25)

success in indoor theatres, despite the attendant reduction in light transmission. This set-up has been found wanting in outdoor theatres, however, where every last lumen is needed to project an acceptable picture.

We have not thoroughly tested the idea of water-cooling the aperture, thus we cannot make any positive statements about it. It is our impression, however, that most of the heat imparted to the film is due to the direct rays from the lamp rather than from contact with the metal parts adjacent to the film. Temperatures of up to 200°F are conducted to these surrounding metal parts; while the temperature in the direct light may exceed 1000°F. Thus while water-cooling the aperture parts may save the projectionist some discomfort, it seems to us that its effect upon the film is decidedly limited.

The air-jet principle appears to be the best solution to this problem. We have not yet completed our investigation as to the degree of temperature reduction on the film effected by this means, but with the use of a blower arrangement we have reduced the temperature of the aperture casting by as much as 40%. In addition to the *indirect* cooling effect this has on the film, the air-jet principle permits what is probably a far more effective action *directly* on the film.

While we don't believe that it is the function of the Society of Motion Picture Engineers to resolve differences of opinion of this nature among manufacturers, it is entirely possible that an SMPE-sponsored investigation of this problem might result in a solution somewhat faster than would be otherwise possible.

By HARRY STRONG

President, Strong Electric Corp.

THE problem of preventing film damage due to heat at the aperture is like the poor—it has always been with us. Since the beginning of the motion picture business there has been a constant demand for more light at the screen, and the constant increasing of this light has resulted in more energy at the aperture, more possibility of film damage, and repetitions of temporary hysteria in the equipment business. But each time that a new source of increased light has been introduced, there has been found a satisfactory means of avoiding resultant film damage.

Many will recall that when we went from the straight arc to the low-intensity, everybody was worried about increased fire hazards. Better projector design solved that.

When we went from the low-intensity to the high-intensity arc a decade ago, there was a temporary wave of complaints from film exchanges because of print damage. This was adequately eliminated by adoption of the rear shutter, in preference to the front shutter, with an attendant reduction of 50% in the radiant energy at the film aperture, and without reducing the picture brilliancy.

With the transition from silent to sound pictures we thought that things were looking up, for the increase in film speed from 16 to 24 frames per second reduced the time any one frame was exposed to the heat. But with the addition of the sound track to the film the size of the picture aperture was reduced, so that in order to project the same amount of light to the screen the energy per unit of film area was necessarily increased, which in turn again aggravated the film buckling problem.

### Print Density an Important Damage Factor

Subsequently, to the end of improving the photographic quality of the picture at the screen, producers began developing their prints to greater densities. Since the radiant energy from the lamp either passes through the film to the screen as light energy, or is retarded in proportion to the density of the film and converted into heat energy within the film, these new prints were more susceptible to damage than the earlier thin prints.

And so the ever increasing quest for more light to adequately illuminate the modern screen has continually been linked with film damage possibilities in direct proportion to the increase in light volume.

Current lamps which have been manufactured for the past several years have been capable of consistently projecting the maximum light that the film would accept without damage and without the use of cooling devices, and they deliver all the light that was necessary for the majority of the screens.

The advent of tremendous size screens, especially in drive-in theatres, has again today brought demands for still more light. These demands have resulted in the development of higher powered arcs which, if operated at their capacity, will provide the necessary increase in light. Simultaneously, increased energy at the film aperture has reintroduced the problem of permanent film damage, or has at least resulted in buckling that causes the film to move laterally both toward and also away from the projection lens, making it difficult, if not impossible, to keep the screen image in focus.

So once more the old bugbear, film damage, is with us. In the few cases where the maximum capacity of the lamp is required, however, the currently available methods or devices for removing some of the energy in the longer wave region have adequately solved the problem.

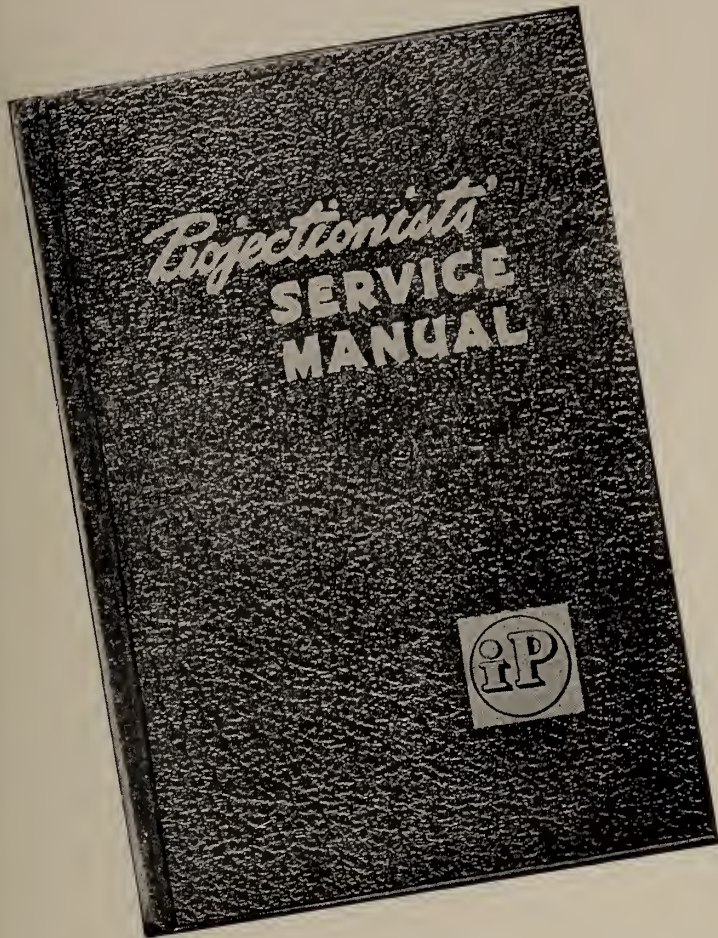
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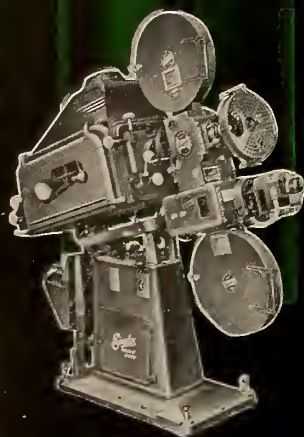
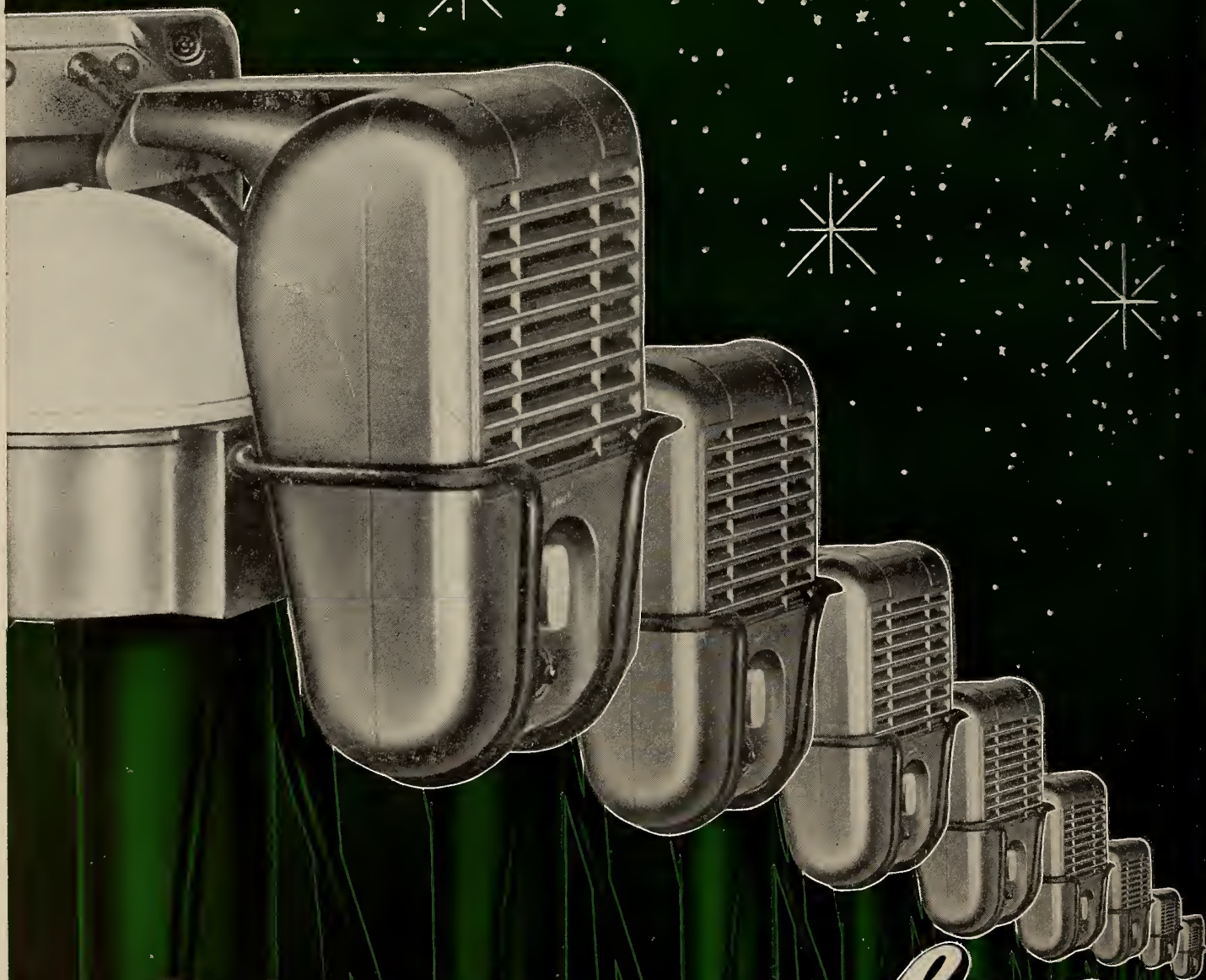
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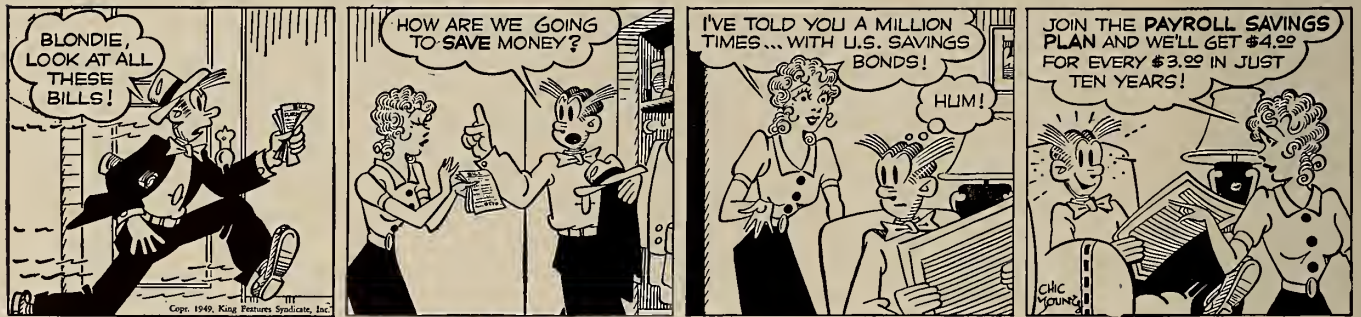
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# INTERNATIONAL PROJECTIONIST

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HENRY B. SELLWOOD, *Editor*

Volume 24

OCTOBER 1949

Number 10

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## MONTHLY CHAT

**R**EPERCUSSIONS of the symposium on cooling methods for high-intensity arcs which was published in these columns last month continue to manifest themselves in IP's mailbag. As was to be expected, IP readers are more than a little perplexed at the sharp differences of opinion evident in the statements by the various equipment manufacturers, no less than they are disappointed at the obvious lack of forthrightness among some of the contributors.

IP readers in general wonder why it is impossible to take the direct approach to a technical problem, such as this one anent cooling, and on the basis of experiment and test come up with the correct answer—one answer. Instead, we were treated to almost as many different opinions as there were contributors, a performance indicative of something less than a sincere desire on the part of the manufacturers to service their customers properly by a forthright approach to this problem.

We may expect to see the lamp manufacturers going on their respective ways by water-cooling the carbons, the while they ignore the problems of the projector manufacturers; the latter will probably continue to utilize one of three possible methods—glass filters, air blast, or water-cooled apertures—to minimize, *but not eliminate*, a definite defect of the projection process.

IP is not happy about the outcome of this abortive effort to effect some sort of general agreement on this problem among the various manufacturers, but it is glad to have been able to provide the means for focusing craft-wide attention upon the topic. Ultimately, and not too far away, the manufacturers of both arc-lamps and projectors will have to square up to this matter—and then it will be much more difficult because the fellow whom they will meet face-to-face will be the purchaser of their equipments.

The mixed reaction evoked among film people by the recent showings of the World Series ball games via television in various theatres does not indicate that this process is a dead horse in an economic sense. Far from it. The Series was on view in practically every tavern in the Eastern states. The real test will come when there exist sufficient theatres Tv-equipped to warrant showings in movie houses exclusively.

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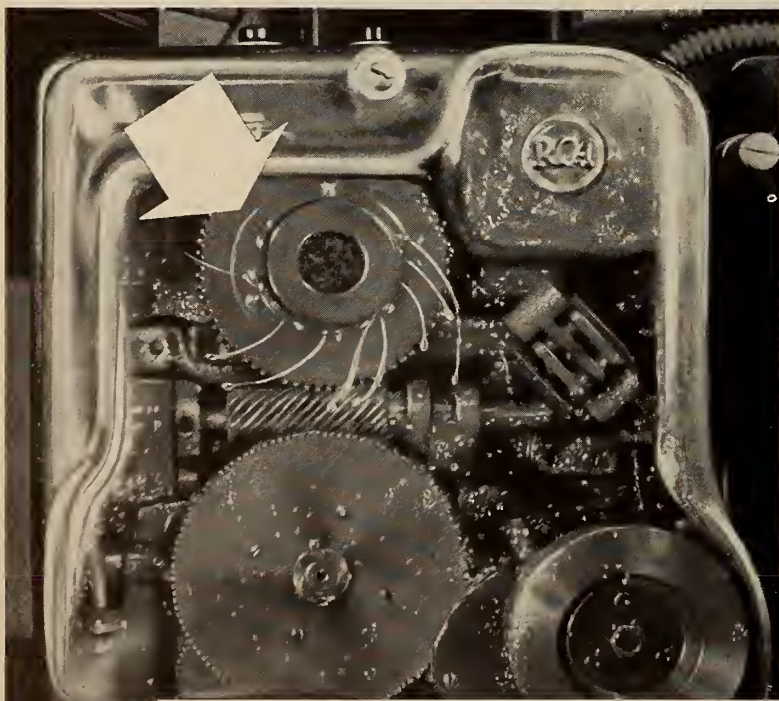
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## Roundup: 'Matched' Projection Optics

*To the Editor of IP:*

Reference is made to the article on the matching of projection optics by Mr. R. A. Mitchell in the March 1949 issue of your publication,\* and also to the subsequent comments on the same topic in both the May† and June‡ issues. We have read all of these with a good deal of interest, but we are somewhat puzzled by the fact that no one has challenged Mr. Mitchell's derivation of his general formula for matching (shown as Fig. 4, page 9, in IP for March; as Fig. 1 in this issue) and also the simplified formula which is based on the fact that the diagonal of the sound film aperture is approximately one inch.

Not only have we been unable to derive the

basic general formula exactly as it appears (Fig. 1) but neither have we been able to see how the simplified form is arrived at after the aforementioned assumption. It is entirely possible that we have overlooked some obvious points, or, as we first suspected, that there is a typographical error; but since no corrections have appeared in subsequent issues, we assume that the formulae as printed are as Mr. Mitchell intended.

Since the results obtained from the use of these formulae actually form the "meat" of the entire article, we would more than appreciate for our own reference further clarification by Mr. Mitchell in a future issue of IP.

A. E. NEUMER, Scientific Bureau  
Bausch & Lomb Optical Company

By DR. J. L. MAULBETSCH  
Kollmorgen Optical Corp.

I HAVE looked into the derivation of the formulas given by Mr. Mitchell\* and have found that, except for a misprint in the accompanying line drawing (designated Fig. 4 on page 9 of IP for March, 1949; reproduced in this issue as Fig. 1) these formulae are correctly derived. As a matter of fact, the "simplified" general formula which is used by Mr. Mitchell throughout the balance of his article can be directly derived in a very simple manner.

The errors in the more complete for-

\* "This 'Matching' of Projection Optics," by Robert A. Mitchell; IP for March 1949, p. 7.

† "Optical Factors in Arc Lamp Design," by J. K. Elderkin and Robert A. Mitchell; IP for May 1949, p. 19.

‡ "Addenda: 'Matched' Projection Optics," by R. H. Cricks and Robert A. Mitchell; IP for June 1949, p. 11.

mula given in the aforementioned line drawing (Fig. 1) are as follows:

1. The plus sign in the numerator should be a multiplication sign, so that

the numerator should read  $fX \frac{m}{\dots}$ ;

2. In the denominator the term multiplying the bracket should be in parentheses: that is, the bracket is to be multi-

plied not only by  $2 \frac{r}{\pi}$  but also by the

square root. The denominator should be:

$$\left( \sqrt{\dots} - 2 \frac{r}{\pi} \right) \left[ \dots \right]$$

3. The letter  $b$  was not referred to in the caption (Fig. 4 in the March issue) and should have been given as the "mirror diameter."

4. The derivation of the expression

$2 \frac{r}{\pi}$  is somewhat obscure, and since the

multiplying factor of  $r$  should depend upon the ratio of aperture height  $h$  to aperture width  $w$ , we can consider the

factor  $\frac{2}{\pi}$  as an average value, which is

close enough in most cases.

At any rate, the magnitude of the term is small compared with the term given by  $\sqrt{h^2 + w^2}$ , as long as the film aperture is not rounded off at the corner with too large a radius.

**Single-Element Lens is a Simplification**

As in any other derivation which has to be technically correct, but must be presented in a simple form, these formulae can be subjected to various criti-

cisms. One such is that they are absolutely correct *only* for a schematic projection lens consisting of a single element; while all projection lenses are compound lenses.

Mr. Mitchell shows that he derives the formulas for a single lens as shown in his drawings (Figs. 1, 2 and 3 in the March issue of IP). The derivation of equivalent formulas for compound lenses would require an assumption upon the strength, diameter and location of the rear element of the projection lens, and would lead into complicated derivations which would detract the attention of the reader from the main conclusions of the article.

R. H. Cricks (technical editor of *Ideal Kinema*, London) attempts to present this point in his article,<sup>‡</sup> but does not do so correctly, as he still shows in his figures a projection lens consisting of a single element.

There is no doubt that this controversial discussion could go on almost interminably, but the main thing to remember is that a projection lens should make full use of the light which is available; when it does this it is a truly matched lens.

An important conclusion is that the F-ratios given for mirrors and projection lenses are not consistent with each other. As Mr. Mitchell points out, this would seem to be a subject meriting investigation by the Society of Motion Picture Engineers.

*Vow, finally, the author of the article which induced the foregoing and sundry other comment, has his say.*

By ROBERT A. MITCHELL

THE mathematical difficulties mentioned by Mr. Neumer, of Bausch & Lomb, are probably due to a misprint in the general formula given in my article\* and also to an error in the expression intended to give the length of the diagonal of the round-cornered projector aperture. This error was pointed out by Dr. Maulbetsch, of Kollmorgen.

In place of the erroneous term  $2 - \frac{r}{\pi}$  a new expression must be found to give the length of the diagonal removed by the rounded aperture corners. Examination of the matter reveals that  $\frac{2}{\pi}$  (suggested by Dr. Maulbetsch\*\* and based, presumably, on my own erroneous form) is almost as unsatisfactory. The following

\*Anent this point, Dr. Maulbetsch observes: "This was not suggested by me. I only mention  $\frac{2}{\pi}$  as the factor multiplying  $r$  and state that it is probably used as an average value by Mr. Mitchell."

line of reasoning, however, appears to give a good value.

Let a square inscribed with a circle be assumed. Now let a diagonal be drawn; and this diagonal will, of course, pass through the common center of square and circle.

Designate that part of the diagonal from center to the circumference of the circle as  $r$ , and, continuing in the same direction, that part from circumference to the corner of the square as  $x$ . Let us now define the sum of  $r$  and  $x$  as  $d$ , which will be considered as the diagonal of a smaller square.

It will be seen that the length of a side of the smaller square is  $r$ . The problem is to find the length of  $x$ .

$$\begin{aligned} d &= r\sqrt{2} \\ x + r &= r\sqrt{2} \\ x &= r\sqrt{2} - r \end{aligned}$$

But the length and diagonal lost from an aperture will be  $2x$ , or  $2r\sqrt{2} - 2r$ . This, then, is the desired quantity to subtract from  $\sqrt{h^2 + w^2}$  to give the length of the diagonal of a round-cornered aperture. (As Dr. Maulbetsch suggested, this term is a function of the ratio of aperture height to aperture width for any given radius of corner curvature; but it will be readily appreciated that large variations in aperture ratio produce only insignificant departures from the true value of the subtracted expression.)

This, however, is a matter of minor importance and does not enter into the basic structure of the main formula for matched projector optics.

The "simplified" equation derived from the general formula was set up in type by the printers, and is correct as it appeared in IP.

The general formula for the calculation of perfectly matching lens speed (together with others associated with the geometric aspect of lens matching) is presented herewith in a form more acceptable to technicians in the optical field. An algebraic derivation of the general formula is also offered.

### The General Formula

The  $F$ -number of a projection lens of given E.F. which *exactly matches* any particular lamp optical system is determined by the following formula in which  $a$  is the diagonal of the projector aperture,  $b$  is the diameter of the lamphouse converging element (reflector or converger of a condensing-lens assembly),  $f$  is the equivalent focal length of the projection lens, and  $m$  is the "working distance" (the length of a straight line extended from the edge of the converger to the plane of the projector aperture, and intercepting that plane perpendicularly). All dimensions substituted for the letters of the formula should be in like units of linear measure.

$$F_o = \frac{fm}{bf + a(f + m)}$$

The foregoing equation, determinate for all values of  $a$ , is the same formula which appeared in an indeterminate form in the March 1949 issue of IP.

The value of  $a$ , the length of the diagonal of the aperture, is given by:

$a = \sqrt{h^2 + w^2} - (2r\sqrt{2} - 2r)$  in which  $h$  is the height and  $w$  the width of the picture aperture, and  $r$  the radius of the rounded aperture corners. When the aperture has square corners,  $r = 0$ , hence the expression  $2r\sqrt{2} - 2r$  reduces to 0.

In the case of the standard 35-mm

FIG. 1. Here is reproduced the drawing from the March 1949 issue of IP (Fig. 4 on p. 9), beneath which appears the original caption. This drawing and caption figure prominently in the accompanying discussion.

**F-number of lens matching lamp optics**

$$F_n = \frac{f + \frac{m}{1 + \frac{b}{\sqrt{h^2 + w^2} - 2\frac{r}{\pi}}}}{\sqrt{h^2 + w^2} - 2\frac{r}{\pi}}$$

This formula is the basis for the optical matching principles discussed in the accompanying article. The simplified 35-mm matched optics formula was derived from this general formula, in which  $f$  is the E. F. of the projection lens,  $m$  is the working distance of the condenser element,  $h$  is aperture height,  $w$  is aperture width, and  $r$  is the radius of the aperture corners if they be rounded. All dimensions are in inches.



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sound film aperture of dimensions 0.600 × 0.825 inch,  $a = 1.041$  inch if the corners are square, and 1.002 if the corners are curves of 0.047-inch radius.

Computations are greatly shortened by employing 1 inch as the length of the aperture diagonal of the 35-mm projection machine, an approximation which does not affect the results materially. It is necessary, when making use of this simplification, to express *all* quantities in the general formula in inches. The "simplified" formula given in IP\* was obtained by letting  $a$  in the general formula equal 1. There is no need to repeat the simplified formula here as the new determinate form supplants it.

### The Efficiency Ratio

The geometric efficiency of a projection lens is the ratio of the speed of a given lens to the speed of a perfectly "matched" lens of the same focus. Each projection setup must be treated individually, for a lens which matches one lamp does not necessarily match another.

Following are three formulas for the calculation of the efficiency-ratio of any projection lens. Symbols are the same as those used in the general formula. All quantities having an inferior  $0$  appended refer to the perfectly matched lens.

$$E = \frac{F_0}{F} \quad (A)$$

$$E = \frac{d}{d_0} \quad (B)$$

$$E = \frac{fm}{F[bf + a(f + m)]} \quad (C)$$

The value of  $E$  may be multiplied by 100 to express the efficiency-ratio as a percentage.

The diameter of any lens (considered as a single element) is given by:

$$d = \frac{f}{F}$$

and the diameter of a perfectly matched lens is given by:

$$d_0 = \frac{bf + a(f + m)}{m}$$

### Derivation of the Formula

The base of operations in developing the general optical matching formula is the simple ratio which defines the speed rating of a lens ( $F$ -number):

$$F = \frac{f}{d} \quad (1)$$

The first member of (1) is regarded as the unknown quantity, the value of which requires transformation of the second member into an expression for

the "matched-lens" value of  $F$ , (herein after represented by  $F_0$ ) for any given values of converger diameter, working distance, lens E.F., and aperture dimensions.

Throughout this discussion the lens is considered as a single-glass element placed at a distance from the aperture equal to its focal length—"infinity focus position." These assumptions are judged entirely in keeping with the requirements of the problem.

The dimensional characteristics of the diverging beam of light which pours lensward from the aperture are of the utmost importance. Viewing the conditions in two-dimensional cross-section, we may say that the outermost sides of the beam emerging from the aperture produce an angle whose vertex is located at some point between the aperture and the converger.

The degree of divergence of the outermost sides of the emergent beam is a resultant of two functions: first, the distance separating converger and aperture; second, the ratio of converger diameter to aperture diagonal. This, of course, suggests the use of the calculus, but the problem also lends itself to algebraic solution.

In the imaginary case of a projector aperture no larger than a mathematical point, the lens  $F_0$  value will be the same as the "spurious"  $F$  value which is commonly (and unwisely) used to rate the speed of the lamp. *The situation is complicated by the fact that a real aperture is an area of quite appreciable magnitude.*

The terms "top" and "bottom" of the aperture used in the following paragraph are understood to refer to the extremities of the aperture *diagonal*.

If a line be drawn from the top of the converging element to the bottom of the aperture and extended, and another be drawn from the bottom of the converger to the top of the aperture and extended, the extended lines will form the outermost sides of the diverging emergent

beam. Outside the limits of the emergent beam so defined no direct rays of light from the converger will in any case be found.

The two lines produced in the aforementioned procedure will be seen to cross at some point on that section of the optical axis which extends from the center of the converger to the center of the aperture. This point, labelled  $P$  in Fig. 2, is the vertex of the angle formed by the sides of the emergent beam.

The distance between  $P$  and the center of the aperture may now be ascertained. Point  $P$  divides the section of optical axis from aperture to converger (working distance, designated by  $m$ ) into two parts,  $y$  and  $z$ . Part  $y$  is that part which extends from  $P$  to the aperture. Because:

$$m = y + z \quad (2)$$

the value of  $m$  in terms of  $y$  is:

$$m = y + ry \quad (3)$$

in which  $r$  is the ratio of  $z$  to  $y$ . Solving for  $y$  we obtain:

$$y = \frac{m}{1 + r} \quad (4)$$

But the lines drawn to define the emergent beam will be seen to form (with converger and aperture "planes") two similar triangles, hence:

$$r = \frac{z}{y} = \frac{b}{a} \quad (5)$$

in which  $b$  is the diameter of the converger and  $a$  is the diagonal of the aperture. Therefore:

$$y = \frac{m}{1 + \frac{b}{a}} \quad (6)$$

The next step involves determining the value of the diameter (or diagonal)  $d$  of the emergent beam at a distance  $f$  from the aperture equal to the focal length of the projection lens. The following self-

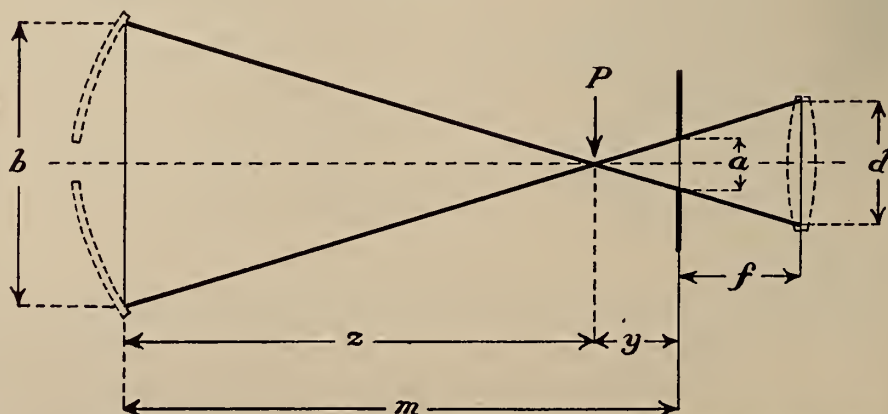


FIG. 2. Graphical exposition of derivation of general formula for computing lens matching speeds.

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**1-KW TO 70 AMPS**

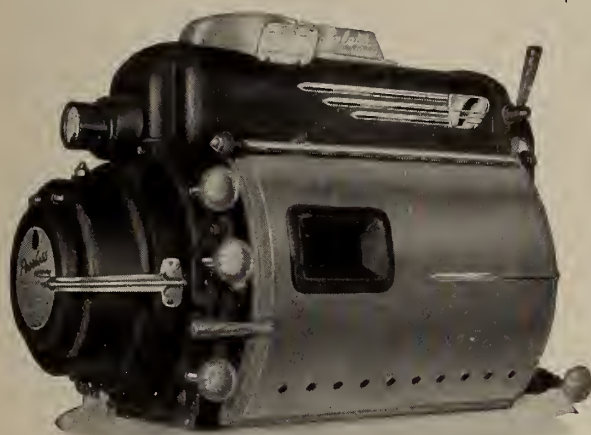
***NEW!***

**"HY-AX" ARC MAGNET**

**"HY-LUMEN" REFLECTOR**

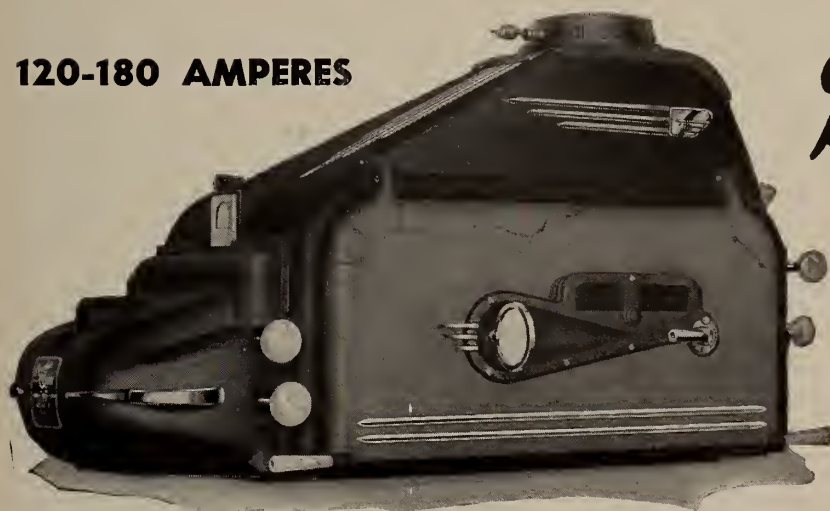
More light at 40 to 70 amperes than ever thought possible. . . . Equals and excels any reflector lamp to 85 amperes, whether they be unapproved water-cooled or resurrected hi-lows. . . . Highest ratio of screen lumens per watt consumed at the arc. . . . At 70 amperes, with a projector having an efficient DISC type revolving shutter, it develops the maximum white light that can be used without a heat filter. . . . Operating costs under these conditions are far below that of 85-ampere lamps.

Magnarc Lamps assure 80% side-to-center (SMPE Standard) screen light distribution, not a deceptive 60% or "Hot Center." . . . They are all Und. Lab., Inc. listed. . . . They are *not* insurance hazards. . . . They are and have been for years "The Standard of Comparison" and "The First Choice" of large and small theatres, drive-ins, and the motion picture industry in general!



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**120-180 AMPERES**



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It is the "Omega" for maximum screen illumination. . . . Nothing can even approach it in white light volume when used with projectors that have efficient DISC type revolving shutters.

Assures satisfying projection for Drive-Ins regardless of the size of the picture, length of throw, and under all weather conditions. . . . They are Und. Lab., Inc. listed and, therefore, *not* insurance hazards.

**"WHY EXPERIMENT?"**



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evident proportion may be solved for  $d$  to give (9).

$$\frac{y}{a} = \frac{f+y}{d} \quad (7)$$

or:

$$dy = a(f+y) \quad (8)$$

hence:

$$d = \frac{a(f+y)}{y} \quad (9)$$

By using (9)  $d$  is eliminated from (1).

$$F_o = \frac{fy}{a(f+y)} \quad (10)$$

and by using (6),  $y$  is thrown from (10).

$$F_o = \frac{\frac{fm}{1 + \frac{b}{a}}}{a \left( f + \frac{m}{1 + \frac{b}{a}} \right)} \quad (11)$$

Reduction of (11), which is indeterminate when  $a$  equals 0, may be accomplished very simply to give the following convenient and perfectly determinate form of the general formula for matched projector optics.

$$F_o = \frac{fm}{bf + a(f+m)} \quad (12)$$

The geometric efficiency-ratio formula (C) is derived from (12) by obvious processes.

The writer invites further criticism and comment from the technical field in regard to the concept of matched projector optics proposed by him.

### 'Ethyloid' a New Film Cement

"Ethyloid" is a new all-purpose film cement made and distributed by Fisher Mfg. Co., 529 Merchants Road, Rochester, 9, N. Y. It is asserted that Ethyloid cement will stand exposed to the air for 24 hours without congealing, that it does not build up on the splice and that it works fast.

A sample bottle of this cement will be sent to any projectionist upon request.

### Weinke, Motiograph Designer, Dies

Emil J. Weinke, 68, chief projector design engineer for Motiograph, Inc., died recently in Chicago after a long illness. Weinke was an industry pioneer, having been associated with Motiograph since the company was founded.

The originator of many advances in projector design and technique, Weinke was granted numerous patents during his long engineering career.

## An Improved Concentrated-Arc Light

IP READERS will be reminded of the several articles which appeared in these pages anent concentrated-arc light sources<sup>1,2,3</sup> by the presentation before the recent SMPE convention in Hollywood of a description of a new high-power, high-intensity electric light developed by Western Union Telegraph Co. Obviously, W. U. has pursued assiduously the development of the zirconium concentrated-arc light.

The data presented herein is a resume of the information supplied to the SMPE meeting by W. D. Buckingham, engineer for W. U.

The luminescent source of the new arc light is two-tenths of an inch in diameter and one-eighth as bright as the sun. The light source, which operates in the open air and not in a glass bulb, is a pool of molten zirconium metal maintained at a temperature near 6500°F.

### Stability, High Luminescence Cited

The new light source is extremely stable in operation, producing a uniformly bright, sharply defined circular spot of white light of dazzling brightness. In a 1000-watt lamp, operating at 55 volts and 18 amperes a-c, the source spot is two-tenths of an inch in diameter and has a maximum brightness of 130,000 candles per square inch, and 20 times the brightness of the ordinary tungsten filament lamp. The total light from the new lamp is 20,000 lumens.

The new lamp, named Telcoarc, is already being tried in a few of the many fields in which they are expected to be used. A 16-mm motion picture projector designed to use a 1000-watt lamp of the new type produces three times as much light on the screen as the currently available projectors using a 1000-watt tungsten filament lamp. The new light, being a much smaller source, will also produce sharper, clearer pictures on the screen.

Operation of the new lamp in the open air without an enclosing glass bulb permits a high output of radiations in the infra-red and the ultra-violet regions of the spectrum, which are cut off by the glass bulb of most light sources.

In one case, the new light was tried in an ultra-violet microscope working at 2600 Angstroms and gave 20 times as much ultra-violet energy as a quartz mercury-vapor lamp. In a searchlight application, it was reported, the new lamp produced over 7 million beam candlepower. A tungsten filament lamp of the same wattage in the same equipment produced less than 500,000 beam candlepower.

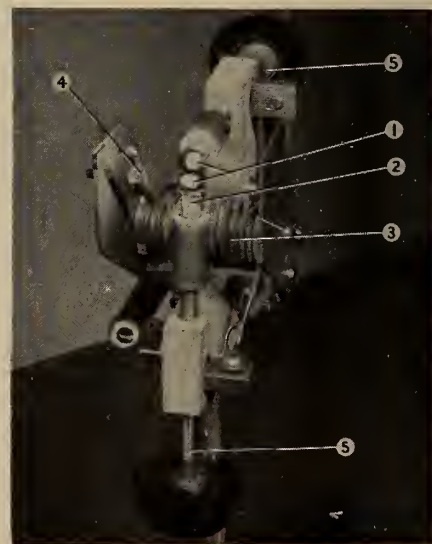
In addition to furnishing a small, high-intensity source with high lumen and actinic efficiency, the new lamp is said to have a continuous spectral energy distribution and a color temperature which holds constant at 3600° K. These last two characteristics are of particular importance in color photography.

In spite of operating in the open air at this extremely high temperature, the new lamp can be made to have a life of several hundred hours. This is due, it was explained, to a unique operating principle whereby the zirconium metal is constantly renewed and reproduced from its own products of combustion. The electrodes are small. When they become exhausted from long use, new ones may be inserted quickly and easily. The new lamps can be made in sizes up to several thousand watts, and to operate from either a-c or d-c.

### Operating Advantages Cited

With its advantage of intense, steady light from a small source, ease of operation long life, the absence of toxic fumes or any fire hazard, and operation from a-c, the new lamp is expected to be used in many places heretofore preempted by other light sources.

A previous Western Union invention based on the same principles was the concentrated-arc lamp, a pin-point source of intensely bright light, which was released from wartime security restrictions three years ago. However, W. U. engineers continued their search for an even higher powered and more intense light to meet many other needs, and the new lamp resulted.



The W.U. concentrated-arc: 1, Zirconium metal surface (active luminous area); 2, Specially prepared electrodes; 3, Differentially coiled electro magnet with wide pole pieces for vertical arc stream control; 4, Permanent magnet for lateral arc stream control; 5, Micrometer screw control for adjustment of electrodes.

<sup>1</sup> "The W. U. Concentrated Arc Lamp"; IP for April 1946, p. 16.

<sup>2</sup> "A Crystal-Gazer at Work"; IP for June 1946, p. 12.

<sup>3</sup> "Concentrated-Arc Light Sources"; IP for April 1947, p. 14.



Change dim screen


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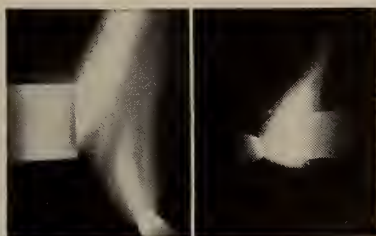
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# Fire Extinguishers in Projection Rooms

By GEORGE R. STEWART  
IA Local 150, Los Angeles

**L**AST year sometime IP published data bearing on the danger inherent in the use of carbon-tetrachloride fire extinguishers in projection rooms.\* Whether this warning was heeded by projectionists generally I don't know; but if it wasn't, then the projectionist craft is strangely indifferent to one of the most serious threats to their physical welfare—and how!

It seems that we are now faced with a new danger which parallels the carbon-tet menace. Many projection rooms in the Los Angeles area (and plenty of others, for all I know) are now equipped with 15-pound CO<sub>2</sub> (carbon dioxide) bottles which were purchased from U.S. Navy surplus supply.

On the outside of these bottles appears the manufacturer's statement: "Non-poisonous, but will not support life"—which we understand to mean that when the gas is used there must be available a goodly amount of fresh air so as to prevent the user being overcome, possibly lapsing into unconsciousness.

## CAB Plane Crash Report on CO<sub>2</sub>

Our suspicions as to the undesirability of using these CO<sub>2</sub> fire extinguishers in a confined space like a projection room were confirmed recently when we received a copy of the report rendered by the Civil Aeronautics Board on the airplane crash which claimed the lives of all 43 persons aboard just outside Mt. Carmel, Pa., on June 17, 1948 (Sa-172; File No. 1-0075-48). The facts given in the following paragraphs were culled from this report.

A United Air Lines DC-6 plane en route from Los Angeles to New York stopped at Chicago where it was given a routine station inspection, serviced and loaded, taking off at 10:44 a. m. At 11:55 the plane captain reported to United at New York that the plane was mechanically okay for a return trip. At 12:27 p. m. the crew acknowledged clearance to descend to an altitude of 11,000 feet.

At 12:31 p. m. the plane notified New York that, following a warning signal by the smoke indicator, CO<sub>2</sub> bottle fire extinguishers had been released in the forward baggage compartment (under the cockpit) and that an emergency descent was being made. The crash occurred at 12:41 p. m.

\*"The Anatomy of Nitrocellulose Film: Its Import to the Projectionist," by Robert A. Mitchell; IP for February 1948, p. 5.

Sections 11 and 12 of the CAB report are particularly interesting:

"Section 11. After the release of CO<sub>2</sub> gas hazardous concentrations of the gas entered into the cockpit.

## 'Physically, Mentally Incapable'

"Section 12. Due to the physiological and toxic effects of high concentrations of CO<sub>2</sub> gas in the cockpit, which would probably not have occurred had the cabin pressure relief valves been open, the members of the flight crew . . . were rendered physically and mentally incapable of performing their duties."

Now, a projection room is not nearly as confining as an airplane cockpit, but the fact remains that CO<sub>2</sub> is very nasty stuff and that nobody can foretell the circumstances under which it might be used in an emergency. There are other and more efficient fire extinguishers than the CO<sub>2</sub> type available, and projectionists everywhere should take immediate action looking toward the removal of these units. It's a damn sure bet that dilatory inspectors and exhibitors won't move in this matter unless they are prodded—or pushed. Push 'em.

Commenting on the foregoing in particular and fire extinguishers in general is this very interesting communication

By ROBERT A. MITCHELL

**I**T is indeed a pleasure to read a contribution from a projectionist who is obviously alert and extremely interested in his work; but I cannot subscribe to the conclusions of the article. It is always unwise to deduce generalizations from one special case, and that is exactly what Mr. Stewart seems to have done. Furthermore, the possibility that the data given by Sections 11 and 12 of the CAB report are incorrect is very strong, for the following reasons:

1. All 43 occupants of the plane were killed in the crash, hence depriving the report of facts derived from the testimony of first-hand witnesses. This materially weakens the credibility of the data.
2. The fact of the existence of smoke indicates trouble of a more serious nature than any probable concentration in the air of the cockpit of CO<sub>2</sub> released from the extinguishers.

## Carbon Monoxide Suggested

3. The manner of incapacitation of the flight crew as given in Sec. 12 does not suggest the effects of CO<sub>2</sub> at all, but seems rather more like poisoning

by a toxic gas such as carbon monoxide.

4. The time between the release of CO<sub>2</sub> from the extinguishers in the baggage compartment under the cockpit (12:31 p.m.) and the crackup of the airplane (12:41 p.m.)—a mere 10 minutes—does not seem sufficient for the production of an asphyxiating concentration of CO<sub>2</sub> and subsequent incapacitation of the crew. Carbon dioxide, we know, is a heavy gas (approx. 1½ heavier than air) and does not diffuse upwards readily.

The foregoing four points are offered not to strengthen my own case in favor of carbon-dioxide extinguishers, but to show the imprudence of placing complete reliance on data not wholly authenticated or in only one set of data. The CAB report furnishes a "lead" for further investigation, but as the sole basis for condemning the use of carbon-dioxide extinguishers in projecting rooms it is valueless.

## Character of Both Gases

IP readers should guard against confusing carbon dioxide and carbon monoxide. The two are entirely different. The

(Continued on page 30)

## Carbon-Tet Extinguishers

Here is an excerpt from the article referred to by Mr. Stewart.\*

Film fires may be put out by cooling the film below its ignition temperature. Ordinary fires may be extinguished by blanketing the blaze with an oxygen-excluding gas such as carbon-tetrachloride vapor, but this is not true of burning film. *Film contains its own oxygen.*

## Efficiency Seriously Doubted

A carbon-tet extinguisher may or may not put out a film fire, depending upon the intensity of the blaze. A hot fire will immediately convert the carbon-tet to gas, thus robbing it of any cooling effect it might have.

In addition to its inefficacy, the nature of vaporized carbon-tet renders this type of extinguisher extremely hazardous to the projectionist. The fumes of carbon-tet are injurious when inhaled (more poisonous than chloroform) and, what is worse, they react with the inevitably-present water vapor of the air in contact with hot iron or iron oxides to form lethal phosgene. (*Phosgene*, the chemical name for which is carbonyl chloride, is a poison gas of warfare.)

*the powerful*

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*projection arc lamp*



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# DeVry's 'Koolite' Unit for H-I Arcs

By E. W. D'ARCY

Chief Engineer, DeVry Corporation

*The appended contribution was received too late to be included in the symposium anent cooling methods for high-intensity projection which appeared in these columns last month.*

**T**HE adverse effects of excess heat upon the film are so well understood throughout the projection field as to require no extensive recounting here. Suffice it to say that not only is the film damaged in the first instance of light-heat contact to an extent which prevents a good screen image, but that particular print will render impossible good projection in subsequent-run theatres. This is quite apart from the damage wrought upon projector parts and the ever-present possibility of physical harm to the projectionist.

With a high-intensity carbon arc operating at 75 amperes the temperature at the center of the aperture is approximately 1350° F. The absorption of heat by the film is proportionate to the density of the silver deposit on the latter, thus a dark scene absorbs sufficient heat to severely emboss the film and result in alternate high and low spots thereon.

## Dual Function Required

We feel that the cooling method employed to overcome this difficulty must serve a dual purpose: it must cool *both* the film and the adjacent projector parts. Two basic methods for accomplishing this purpose suggest themselves immediately: liquid cooling through channels installed in the aperture bracket, and forced cooling by means of directing an air blast against both the film and projector parts.

Based on extensive tests, DeVry has developed the "Koolite" system of air-blast cooling for the projector head.

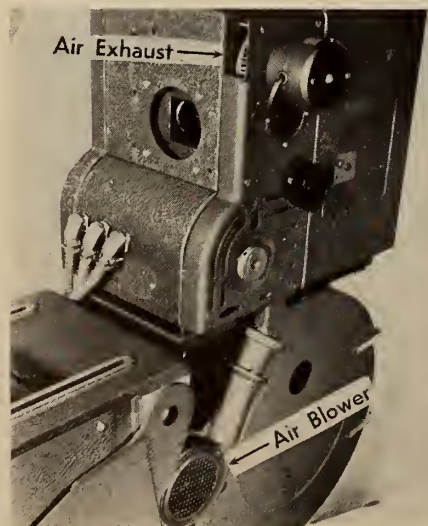


FIG. 1. 'Koolite' mounted on DeVry projector.

Fig. 1 shows the mounting of this unit and the means for ingress and exit of the air.

Indicative of the effectiveness of this system are the two curves shown in Fig. 2. These curves reflect data compiled without film in the projector, a condition not of normal operation but still one frequently employed when checking uniformity of illumination, arc lamp alignment and mirror adjustment. Fig. 3 tells the story of what happens with and with-

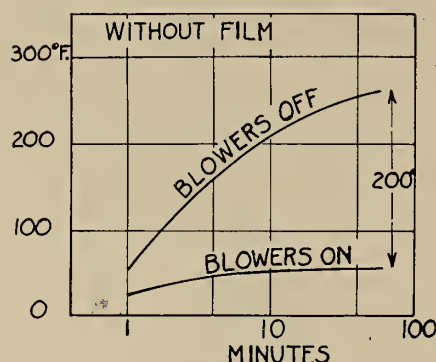


FIGURE 2

out the blower in operation: the blower reduces the temperature 200° in the immediate area of the aperture, and it undoubtedly exerts a marked beneficial effect upon those other parts exposed to arclight cone spillover.

Figure 3 corroborates the data given

in Fig. 2. It can be seen that after 60 minutes' operation the top temperature rise is 85°; with air-blast cooling, however, this rise is held to 35°—a clear-cut gain of 50°. The Koolite unit consists of a blower which directs an air blast over the entire aperture area past the face of the film and an exhaust section which removes the heated air from the projector head.

A good indication of the degree of cooling possible by an air-wipe directed at the aperture is given by measurements obtained using a thermocouple installed in an asbestos plate and then clamped into position in the exact center of the aperture. The results were as follows:

Light Source: 70-Amp. Suprex Carbons

No Air Blast: 1350° F.

With Air Blast: 450° F.

During these air-blast tests we have repeatedly run test loops of film through

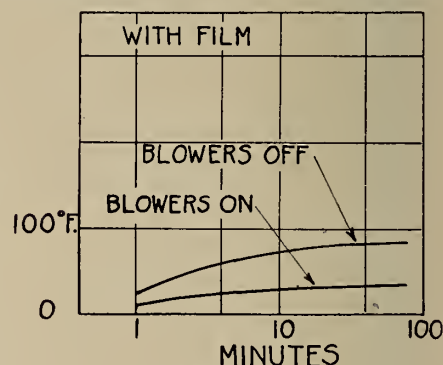


FIGURE 3

a projector in excess of 3,000 times without any sign of film damage. Contrariwise, however, similar runs of film have resulted in severe embossing and extreme brittleness. It is understood, of course, that this air blast is directed *across* not *at* the face of the film.

## The Starke Cycloramic Projection Screen

By HERBERT A. STARKE

1A Local 150, Los Angeles

**S**INCE the advent of sound pictures the need for a motion picture screen which would reflect a suitable amount of light without harmful glare has been recognized within the industry. When viewing the auditorium it has been noted that the front and side seats are the last to be occupied. The audience has been keenly aware of the fact that the picture image did not appear pleasing from this area.

The Cycloramic screen has been designed to overcome this fault. Tests by Photo Research Corp. show that there is no fall-off of screen light up to and including 60 degrees off center. To attain these results a top grade of combed cotton was selected. The screen body

consists of three layers of this material. The threads of each layer are impregnated with opposing chemicals, the nature of which we do not wish to divulge at this time.

## New Optical Principle Cited

We believe that we are introducing an entirely new physical (optical) principle in the production of this screen. Heretofore the natural yellowing of screen fabrics had been temporarily counteracted by the addition of a blue tint which was added to the plasticizer. This was applied to the fabric, and when combined with the yellow to obtain the illusion of white, the yellow ground was plus-blue, creating objectionable grayish tones which, in turn, absorbed a severe amount of light.

The Cycloramic process produces an

indiscernible fluorescence which is activated by the ultra-violet rays emanating from the arc source. This creates intensive light reflection.

It is emphasized that the Cycloramic screen contains no plasticizers or pigments whatsoever. Whether they be flaked aluminum or white pigments combined with ethyl cellulose, all known plasticizers have been found to discolor rapidly. A reliable investigating body has certified that screen surfaces so treated will deteriorate approximately 4% per month under ideal conditions, discoloration beginning immediately.

#### Numerous Advantages Seen

The Cycloramic screen, however, will not discolor from natural causes. The surface is practically indestructible and is not subject to abrasion. It is thoroughly fireproof as well as being immune to fungus or mildew. By the use of specially designed machines, a seam has been created which is practically invisible.

This screen may be successfully packed in small containers: for example, a screen 18x24 ft. is shipped in containers having an inside measurement of 2.7

cubic feet and weighing only 19 pounds, thereby effecting a considerable saving to the purchaser.

During the long series of tests conducted principally at the RKO Studios, Hollywood, it was established that by the use of this specially woven material, eliminating the need for perforations, perfect sound transmission was attained. The increased number of very small holes (pores) much more closely spaced than the conventional perforated surfaces, improved the characteristics at the higher frequencies by completely reducing back-stage reverberations as well as producing a better high-frequency distribution within the audience area.

#### Individual Theatre Requisites

The B. F. Shearer Company has established a factory at Seattle, Washington, for the production of the Cycloramic screen. It is their policy to manufacture the screens to exact individual theatre specifications in order to render saleable front and side seats, enhance color photography as well as reproduce black-and-white film as it was photographed, and be economical due to such features as low shipping cost, ease of installation and cleaning, as well as durability.

35 long x 24 wide x 28 high, which large content of 20,000 cubic inches combines with the forced air cooling of the positive carbon feeding mechanism to assure low operating temperatures within the lamphouse even when burned at 130 amperes.

#### Precise Arc Crater Positioning

The position of the positive arc crater is automatically maintained at the exact focal point of the reflector by means of Strong's exclusive Lightronic crater positioning system. The positive and the negative carbons are advanced by separate motors the speeds of which are governed by the bi-metal Lightronic tube. Once the arc has been struck, the crater positioning and the arc-gap length are automatically maintained without manual adjustment or any further attention being required.

A stream of air directed just above the arc stabilizes its burning, assures complete combustion of any black soot, and carries away the white smoke which would otherwise be deposited on the reflector.

#### Optics: 16½-Inch, F:1.9 Reflector

The optical system comprises an elliptical reflector 16½" in diameter with a resultant speed of F:1.9 to match the currently available high-speed F:1.9 projection lens. The mirror and its tilting mechanism are an integral part of the back door of the lamphouse, which swings out to allow easy cleaning of the reflector and convenient trimming of the lamp.

The Strong Mighty "90" features unit construction whereby the various components are instantly removable for cleaning and inspection. The lamphouse is finished in attractive gunmetal gray with chrome trim and weighs 165 pounds. There is an arc imager, an ammeter for reading the current at the arc, an automatic trimming and framing light, and an inside dowser system.

## Strong's New 'Mighty 90' 75-125 Amp. Reflector-Type Projection Arc

**D**ESIGNED especially for those applications where the light requirements far exceed the capacities of lamps heretofore available, the Strong Mighty "90" 75 to 125 ampere high-intensity projection arc lamp was unveiled at the recent TESMA theatre equipment exhibit at Chicago. This new lamp, a product of The Strong Electric Corp., Toledo, is said to project a volume of light even far beyond that necessary to illuminate the tremendous screens used in the largest drive-ins.

The Mighty "90", which burns a 9-mm x 20" plain high-intensity positive with a 5/16" x 9" copper-coated negative at 90 amperes, delivers 21,000 lumens. The generous sized lamphouse and rugged burner mechanism have been designed to burn the larger carbons at up to 130 amperes, at which current 26,000 lumens are available. This compares with the 17,000 lumens projected by the 70-ampere Suprex, and the 7000 lumens of the 1 KW lamp.

The lamphouse measures, in inches,

TWO VIEWS OF STRONG ELECTRIC CORP.'S NEW 'MIGHTY 90', 75-125 AMP., HIGH-INTENSITY, REFLECTOR ARC LAMP



At the left is shown the completely enclosed lamphouse, with all manual controls visible. The right-hand view shows the interior of the lamp, with the 16½-inch mirror mounted on the rear door which swings open for ease of trimming and general servicing. Trim positioning, compact feed assembly, and overall sharpness of design lines are clearly evident.



# Questions and Answers on Projection Lenses

*In response to widespread demand from our readers for presentation in compact form, the appended data were compiled from the highly informative series of ads sponsored by Kollmorgen Optical Corp. exclusively in IP during the past year.*

## WHAT IS THE DEPOSIT THAT FORMS ON LENS SURFACES?

This deposit may be dust, fumes from the arclamp housing, or oil. Poor ventilation of the projector or projection room will probably cause a deposit to form on any glass surface in either projector or room.

## WHAT COMPRISES THE COATING ON SNAPLITE PROJECTION LENSES?

All glass-to-air surfaces (all surfaces except the cemented ones) are coated with a thin film of hard magnesium-fluoride.

## JUST WHAT DOES THIS COATING DO?

The coating decreases internal reflections and increases light transmission at each surface. By practically eliminating stray light it improves contrast, brings out colors more fully, and increases the brightness of the picture.

## HOW MUCH BRIGHTER DOES THE LENS COATING MAKE THE PICTURE?

The coating increases light transmission about 4% per lens surface. Thus the Super-Snaplite, having eight coated glass-to-air surfaces, transmits about 30% more light than would a similar lens with uncoated surfaces.

## WHAT CAUSES COATED LENSES TO BECOME CLOUDY?

The magnesium-fluoride coating does not cause cloudiness, but it might, because of its purple-straw color, make the cloudiness more apparent. Under the same conditions, uncoated lenses will also have the deposit.

## WHY ARE SHORT FOCAL LENGTH LENSES USED FOR DRIVE-IN THEATRES?

Where the projection room must be located near the screen, short focal length lenses are necessary to project large pictures. For this reason lenses with focal lengths of from 2 to 3½ inches are usually used in drive-in thea-

tres. The Kollmorgen Screen Chart shows the focal length needed for pictures from 9 to 85 feet wide at from 40 to 400 feet projection distance (throw).

## DO SHORT FOCAL LENGTH LENSES GIVE HIGH-QUALITY PICTURES?

Short focal length lenses for wide-angle projection are quite difficult to design, but special attention to this phase in computing the lens results in an efficient unit.

## DOES THE PICTURE PROJECTED BY A SUPER-SNAPLITE HAVE THE SAME QUALITY AT ALL FOCAL LENGTHS?

Yes. Due to unique design, the picture projected by a 2-inch lens shows as good definition, flatness of field and uniformity of light as with the more popular sizes, such as the 4- or 4½-inch lenses.

## ARE THE SIZES OF THE VARIOUS ELEMENTS THE SAME FOR ALL FOCAL LENGTHS?

No; the elements are designed specifically for each focal length and vary in size.

## WHAT IS THE TOLERANCE IN FOCAL LENGTH FOR A GOOD MODERN LENS?

A good modern lens should be within the 1% plus-or-minus tolerance area recommended by the Society of Motion Picture Engineers.

## IN ACTUAL PRACTICE, WHAT DOES THIS PLUS-OR-MINUS 1% MEAN?

It means that the actual picture size for any focal length lens will be within 1% plus-or-minus of the computed picture size. Thus, if a 20-foot wide picture (240 inches) is desired, the actual projected picture might be 238 or 242 inches and still fall within the accepted tolerance.

## DOES THE F:1.9 SUPER-SNAPLITE HAVE A TRUE SPEED OF F:1.9?

Yes, in all sizes from 2 inches through 4¾ inches. The 5-inch size has a speed of F: 2.0.

## WHY DOES THE 5-INCH SIZE DIFFER IN SPEED FROM THE SHORTER FOCAL LENGTHS?

This is due to the limited space provided in some projectors. In other words, a 5-inch lens having a speed of F:1.9 would not fit into some present projectors because of the large diameter lens barrel required.

## DOES THE SUPER-SNAPLITE LENS HAVE DIAPHRAGMS?

No; the full aperture is utilized in all focal lengths.

## DOES A FAST LENS ELIMINATE THE SO-CALLED 'HOT SPOT'?

Yes, to a very large extent. The faster the lens and the higher its quality, the more uniform will be the screen illumination.

## IS THIS 'HOT SPOT' WORSE WITH SHORT FOCAL LENGTH LENSES?

Usually. The falling-off in screen illumination at the corners can be quite severe with poor lenses. When this problem is given full consideration in the lens design, remarkably even screen illumination is achieved.

## IF THE SPEED OF AN ARCLAMP BE SLOWER THAN THE LENS, WHY USE A FAST LENS?

This topic has been discussed in detail in various issues of IP, including an article by Dr. J. L. Maulbetsch, of Kollmorgen Optical Co.\* In brief, a fast lens gives more illumination because, having larger lens elements, it picks up more of the edge illumination than does a slower lens with correspondingly smaller lens elements.

## ARE ADAPTERS NECESSARY FOR SNAPLITE LENSES?

Fittings are available to adapt, where necessary, Snaplite lenses to all currently manufactured professional projectors.

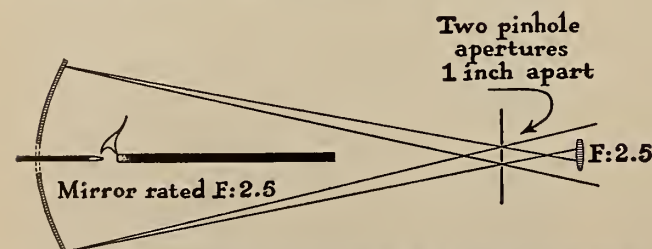
## ARE ADAPTER DRAWINGS AVAILABLE?

The required adapters are shown in Kollmorgen Bulletins Nos. 204 and 206. Dimensions of all adapters except the shade tubes are fixed. The length of the shade tube varies with the focal length of the lens.

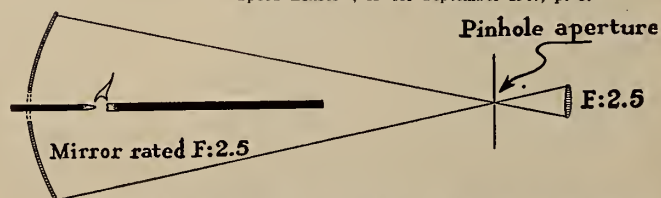
## HOW MANY LENS ELEMENTS ARE THERE IN A SUPER-SNAPLITE?

Six: two pairs of elements are cemented together.

\* "Uniform Screen Illumination as Related to High-Speed Lenses"; IP for September 1947, p. 5.



Showing actual optical conditions in a projector. Note that an F:2.5 lens does not match an F:2.5 mirror. A large proportion of the light from the illuminated aperture is lost.



An F:2.5 lens "matched" to an F:2.5 mirror—in theory, but not as conditions exist in an actual projector.



# TELECASTS

## World Series Theatre Tv Evokes Mixed Reaction

INDUSTRY opinion as to the worth of theatre television was sharply divided following the presentation on six theatre screens east of the Mississippi of the World Series baseball games, which in all cases augmented the regular film program.

While the Tv adherents asserted that the telecasts inaugurated a "new era of showmanship," the skeptics stressed the fact that most of the theatres involved in the experiment failed to pull capacity attendance. Preponderance of opinion was that all future theatre Tv events must be on an exclusive basis if the industry is to benefit fully.

A city-by-city roundup of the series reception, as compiled by *The Film Daily*, is appended:

Brooklyn—Opening day attendance in excess of 3,000 in the 4100-seat Fabian Fox Theatre. Attendance fell off to 2,800 and 2,400, respectively, on second and third day and then jumped above the 3,000 mark for Saturday and Sunday. Regular 55-cent admission was increased to \$1.25 during the week, and \$1.50 for the week-end. Confection sales quadrupled. Reception very good.

Boston—Patronage at the 1800-seat Pilgrim Theater for the five days hit 5,000, with Saturday the biggest draw. Admissions were scaled at \$1.50 but the balcony seats at 85 cents failed to draw and were discontinued. Management expressed disappointment at the returns in the light of an anticipated capacity had the Red Sox been in the series, but were optimistic about the presentation of future televised events.

### Chicago's Intermediate Showing

Chicago—Upwards of 10,000 saw the five games at the B & K State Lake Theater at \$1.25 scale. This was the only house in the Paramount intermediate theater tele system which puts the program on film and then projects on the regular screen. Necessity of bringing the film over from the Chicago Theater in which the processing equipment is installed was responsible for several breaks in transmission and a time lag of 20 minutes from the actual action. Special announcers took over during the breaks and kept the crowd happy. Many patrons inquired as to whether football games would be shown this Fall. Opinion around Film Row is that theater Tv is here to stay, and while the initial expense is heavy, ways will be found to share them.

Milwaukee—This was the only city where the series was available on two screens. Both houses, the Oriental and Tower, are

located in residential districts, several miles from downtown first run. Tower seats 1,585 and the Oriental 2,200. After the first day when transmission bugs were responsible for only a fair image, the reception was highly satisfactory, with many in the audience reporting it superior to their home sets. Average attendance approached two-thirds of capacity, with the best grosses on the final day, Sunday. Admission price at both houses was \$1.50. Many inquiries were received by the management regarding future video attractions.

Scranton—The 1,800-seat West Side Theater played to capacity audiences during each of the five games telecast here. Admission price was only 30 cents, however, with all profits going to the Community Chest.

\* \* \*

### Par's 20-Second Portable Tv Unit

The recent convention of the Theatre Owners of America, held in Hollywood, saw the first demonstration of the new

Paramount portable theatre Tv system which allows only a 20-second time lapse between the appearance of the Tv signal on the tube face and its film projection on a large theatre screen. This means that Par has cut its processing time on such film by 35 seconds.

Paramount's determination to build a nation-wide system of Tv station affiliates was emphasized by the recent announcement by Station KBTv that it had signed up "as the first affiliate in the new, up-and-coming Paramount Tv network. Several other stations, a few of whom are severing connections with other networks, will sign contracts with Paramount shortly," the announcement said.

Paramount intends, it was said, to supply its station affiliates "with the best film entertainment yet produced, utilizing its many years of motion picture experience, vast production facilities and large

(Continued on page 24)

## CHICAGO LOCAL 110 BUILDS CRAFT PRESTIGE: TRIBUTE BY TV EXECUTIVE



Tv equipment shown, from left to right: line amplifier, monitoring oscilloscope, and control console. Local 110 members handled this equipment.

Only the foresight of this progressive organization, under the leadership of Gene Atkinson and his able associates, enabled the publication of this very significant picture in which are shown projectionists who work under contracts signed long before television developed its present imposing stature.

Seen here are Joseph Hovorka, Bobby Burns and Ira Jacobson, all members of Local 110, on the occasion of the transmittal of Tv images to the assemblage at the recent joint

TESMA-TEDA convention in Chicago. Said Barton Kreuzer, manager of RCA's Theatre and Film Recording Department:

"I confess that it was not without some misgiving that I entrusted the first showings of television to men who, I imagined, were not too well versed in the niceties of this exacting art. However, I want to say to this assemblage that the success of this demonstration here today is due in no small measure to the ability and seasoned experience of these craftsmen."

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**T**HAT workers in all crafts are more interested in some form of security after a given number of years' work rather than peak current wages was brought home sharply to us in recent trips about the country during which we got together with several groups of our fellows and, as usual, talked a little "shop." The important point here, we think, is that these various groups were not composed largely of old-timers who might be expected to bear down heavily on the security angle, but included men whose craft service ranged from eight years upward.

Naturally the talk got around to the Chicago Local 110 pension plan, and there was general agreement that this set-up with its various benefits was a fine thing, particularly for the oldster who wished to retire. But there was other talk, too, which was not so pleasant and not so favorable to the worker, old or young.

There was talk, for instance, of the various "pension" plans instituted by various circuits which ran along for years and then blew up right in the workers' faces when the theatre was sold or the circuit decided to "make a change" or some such stuff. There was talk, too, about the classic case where a man who worked in one theatre for 30 years was forced to retire due to failing eyesight—and the theatre gave him one week's salary as severance pay!

Mention was made in one session that in the absence of any concrete security provision, projectionists should benefit by a profit-sharing plan under which a part of the profits would be set aside either for periodical distribution or for deposit to individual accounts and distribution contingent upon retirement, disability, severance or some other condition. There has been very little thought given by the craft to a profit-sharing plan, probably because projectionists do not actually produce anything in the same sense that a factory worker does but rather is regarded as one who renders service.

Upon returning home from our most recent trip, we got to thinking about this profit-sharing idea and did a little dig-

ging by getting some data from the National Industrial Conference Board and the Council of Profit-Sharing Industries, which we pass along here.

We were surprised to learn that not

## BUSINESS AGENT FOR 25 YEARS



Bill Hartnett (center) is given the keys to a sleek new Dodge sedan in recognition of his 25 years of service to Ottawa, Can., Local 257. At left is A. B. Zumar, sec.-treas., and (right) James McGuire, pres., of L. 257.

only are profit-sharing plans spreading rapidly in various industries but also that executives of companies having such plans are, as one report states, "over-

whelmingly enthusiastic" about their benefits to both the companies and workers. An idea of how rapidly such plans are growing may be had from the fact that in some localities banks are actively competing for the business of handling the trust funds.

Several of the reports at hand mention the fact that in past years unions were strongly opposed to any profit-sharing plan, the most effort being exerted in getting the highest wages possible. The growing concentration by unions on some form of security for their members is reflected by the fact that at the present time "union opposition to profit-sharing has largely evaporated"; in fact, certain units of both the A. F. of L. and CIO now insist upon writing the profit-sharing arrangement into the labor contract.

Here are a couple of typical comments by executives of companies which have profit-sharing plans in operation:

A. R. Meeker, president, Meeker Mimeograph Co., Newark: "In my opinion, the chief advantage is that the employees do develop a feeling of really belonging to the organization and a sense of ownership and responsibility. With this feeling prevalent a minimum of supervision is required. \* \* \* Over

## IA STATE CONFERENCE AT ILLINOIS FEDERATION OF LABOR CONVENTION



Seated: Earl J. McMahan, secretary, Illinois Federation of Labor; Felix D. Snow, 6th IA vice-president; IA President Richard Walsh; Frank Stickling and William Donnelly, IA representatives; John H. Wald, 9th District secretary and also secretary of Illinois State Conference.

Standing: Sam Banansinga, president, Springfield Local 138 and vice-president, Ill. State F. of L.; W. F. Wepner, secretary, Springfield Local 323; Tony Stuches, business representative, and C. A. Wallace, president, Local 323. Next are Conference Board members with their IA Local designations: Fred Shoup, Bloomington, 193; Ray McNickle, E. St. Louis, 288; S. Lamasky, Chicago, B-45; R. Engel, Galesburg, 166; then L. C. Brawnlow, 323, Federation delegate.

## BEAUTY, UTILITY IN FLORIDA PARADE



Labor Day float of Fort Lauderdale IA Local 646 presents pretty girls watching a screen show, ushers standing in attendance, and the projectionist, C. W. Goethe.

the years we have gotten cooperation and teamwork to a remarkable degree."

D. R. Thompson, secretary, the Snow-Nabstedt Gear Corporation, Hamden, Conn.: "Our plan has been in continuous operation, in good times and bad, for a period of twenty-six years, and we feel that it has been one of the greatest single factors in our pleasant personnel relationship."

Whether profit-sharing is feasible for projectionist organizations because of the nature of the service they render is a very difficult question to answer and one that would require a lot of straight thinking and planning. But we do know that the operation of the Local 110 pension plan has set local union leaders all over the country to thinking about some form of security for their members.

Do you remember when paid vacations for projectionists was a revolutionary idea?

If union leaders run into a stone wall in their efforts to establish a security program in one form or another, they might consider going after some profit-sharing plan. If the foregoing paragraphs set the thinking wheels turning along the lines of benefit plans, they will have well served their purpose.

- The IA General Office recently announced the signing of three-year contracts, retroactive to August 6, 1948, for 1000 Philadelphia movie theatre workers, members of Local B-100, who last Spring rejected a bid to jump to John L. Lewis' District 50. United Mine Workers. In addition to pay increases, the contracts provide a week's vacation with pay for all employed over one year and who work 18 hours or more per week; those employed over five years get two weeks paid vacations. These contracts affect employes of the Warner, Paramount and Fox circuits, and the Theatre Cleaning Service.

- California District No. 2 will hold its 1950 meeting in Hollywood, with Local 165 acting as host to the delegates.

- The Museum of Modern Art in New York City was the scene of a party sponsored by Local 306 officials in honor of Steve D'Inzillo, business representative. President Herman Gelber was master of ceremonies, with Harry Storin, Ernie

## QUANTITY, QUALITY THROUGH THE YEARS



Ted Bowers, business agent of IA Local 64, Wheeling, W. Va., the father of 13 children of whom 5 sons belong to L. 64. This picture forwarded by Al Boudouris of Theatre Equipment Co., Toledo.

Lang, Harry Garfman, Izzy Schwartz, Ben Scher and Frank Inciardi serving on the arrangements committee.

- Congratulations to Bert Steinhauser, business representative of Local 373, Terre Haute, Ind., on his re-election to office for his 20th consecutive term.

- Allen G. Smith, National Theatre Supply Co.'s popular New York branch manager, recently underwent minor surgery at the Wickersham Hospital. Allen is feeling pretty slick again and from *sub rosa* reports reaching this corner he seems to have been completely rejuvenated.

- Milwaukee Local 164 was well represented at the recent TESMA-TEDA meeting in Chicago. Particularly interested in the RCA tele demonstration were Glen Kalkhoff, pres.; Oscar E. Olson, bus. rep.; George Beck, Karl Miller, Myrl Melton, Alex Zebe, Rudy Willert, Karl Fergens, Harry Post, Charles Herbst, Frank Wagner, and Henry Putsear.

- Lou Walters, former district manager for Ampro Corp., has given up the theatre supply business and joined the ranks of projectionists. His application for membership in Dallas Local 249 was approved last month and he now is working at the Kaufman Pike Drive-In Theatre. We are sure that Lou will prove a valuable member to Local 249, and we wish him lots of luck in his new calling.

- Many IA Local Unions were represented at the recent Connecticut State Federation of Labor Convention, which was held at the Hotel Garde in New Haven. Mike Scanlon, business representative of Torrington Local 402, and Frank Corrigan, business representative. Waterbury Local 88, were candidates for the office of Federation vice-president.

Other IA delegates were John Martin, Bridgeport Local 277; Charles North, Hartford Local 486; John McGlew, Meriden Local 350; Rube K. Lewis, Hartford Local 84; James Corrigan and Frank Carey, Waterbury Local 304; Matt Ken-

## CALIFORNIA DISTRICT COUNCIL NO. 2 HOLDS ANNUAL MEETING IN SAN BERNARDINO



San Bernardino Local 577 and Barstow Local 730 entertain District No. 2 delegates at a beef-steak dinner. Seated, left to right: Robert Bennett, bus. rep. San Bernardino L. 577; Ralph Adams, District Council vice-pres. and bus. rep. Santa Ana L. 504; Carl Cooper, International 7th vice-pres.; Wm. Wise, Council pres.; Alonzo Bennett, Council sec.-treas. and sec.-treas. Long Beach L. 521; Harry Beauford, bus. rep., J. O. Jones, pres. and Rudy Trotter, sec.-treas., all of Barstow L. 730.

Standing, left to right: Charles Collins, pres. San Diego L. 297; Stanley Campbell, bus. rep. Hollywood L. 706; Walter McCormick, pres. Hollywood L. 165; John Lehnars, bus. rep. Los Angeles L. 776; Earl Hamilton, pres. Los Angeles L. 150; Herb. Aller, bus. rep. Hollywood L. 659; Norman Morris, bus. rep. El Centro L. 656; Chas. Vencill, sec.-treas. and Magnus Nielsen, bus. rep. of Los Angeles L. 150; W. L. Coleman, sec.-treas. and Art Narath, pres. of Santa Ana L. 504; Chas. Baumgartner, sec.-treas. and Wm. Romley, bus. rep. of Bakersfield L. 215; Basil Davis, pres. and Harry Reynolds, chairman, Wage Scale Com. San Bernardino L. 577; L. S. Hall, bus. rep. San Diego L. 297; Max Miller, pres. Long Beach L. 521; John Gotchell, sec.-treas. Santa Barbara L. 442; W. Caplan, sec.-treas. Hollywood L. 705; and Cecil Walters, bus. rep. L. 294, Phoenix, Ariz. The meeting was voted the best Council gathering ever.

nedy, New Haven Local 273; Fred Nowell, New London Local 439; Joe Tassinero, Bridgeport Local 109; Fred Matthews, New Britain Local 301; John Miller, New Haven Local 74, and Irving C. Lown, Danbury Local 662.

- James A. Whitebone, secretary and business representative for Local 440, St. John, N. B., has been re-elected to serve his 16th term as president of the New Brunswick Federation of Labor. Whitebone has rounded out more than 20 years of service as an official of Local 440, during which time he has become known throughout the Alliance as a very able and conscientious labor leader.

- Another chest-puffer for cause: Joe De Renzis, business agent for Local 710, Stroudsburg, Penna., is broadcasting on an ultra-high wavelength about the newcomer to his home. Heir or heiress, Joe?

- The 25-30 Club of New York City launched its 1949-50 season with one of the best meetings in its history, from the standpoint of attendance and proceedings. The great turnout of members were given a rare treat by the appearance of J. A. Fetherston, sales manager of the Kollmorgen Optical Corp., who gave a candid and no-holds-barred presentation of modern projection optics. More such sessions on a wider scale throughout the country would benefit the craft.

Cecil R. Wood, Sr., got off to a fast start for his presidential year, and it evoked a flood of memories to see this old-timer in the craft do his stuff.

- Sad news occasionally breaks into these columns, such as the recent death of Flo Jackson, wife of Howard Jackson, business representative of Local 343, Omaha, Nebr. Mrs. Jackson came from a well-

## AT ALTEC'S 12TH ANNIVERSARY PARTY



No exchange of weighty topics but good fellowship is evidenced by this shot of Altecmen D. L. Netter, Jr., C. S. Perkins and Harold Wengler, and, second from right, Harry Sherman of IP.

known theatrical family and was known professionally as Flo LaDell. She accompanied Howard to many IA gatherings and was known to many of the old-timers. We sympathize deeply with Howard in his loss.

- The Illinois State Conference meeting was held in Springfield last month in conjunction with the Illinois State Federation of Labor Convention. Frank Stickling, IA representative of the 9th District, presided. The Conference meeting closed with a party tendered the delegates and guests at the Elks Club. Committees appointed by Springfield Locals 323 and 138 were in charge of arrangements.

- Charlie Keeler was elected business representative for Local 597, Waco, Texas, succeeding Bob Foster, who resigned because of ill health.

- We were looking forward to a meeting with our good friend Vern Harris, former

secretary of Toledo Local 228, who planned to visit the IP offices while on a vacation trip. Then we received word from him advising us of a rather unpleasant experience he had. Vern's car was broken into while visiting friends in Camden, N. J., en route to New York, and all of his and Mrs. Harris' belongings were stolen. Not a very pleasant ending to an anticipated pleasure trip.

- A salute to the officials of Local 350, Meriden, Conn., for their effective picketing of a non-union house. Several weeks of intensive picketing of the new Meriden Theatre, which opened last August with non-union projectionists, resulted in the signing of an agreement with Local 350.

- Roy Brewer, IA West Coast representative, was unanimously re-elected chairman of the AFL Hollywood Film Council, which represents about 20,000 studio employees.

- Pittsburgh Local 171 celebrated its 40th anniversary with a banquet on September 20 last. President Walsh, Secretary Raoul, and other top IA officials were present at the affair. Mayor Lawrence of Pittsburgh and a number of prominent civic leaders were among the invited guests present.

On behalf of Local 171, President Walsh presented two charter members, Clyde Cain and Arthur G. Williams, with gold wrist watches.

- New York Local 306 television classes for the 1949-50 season opened September 19 last with a high registration. Registrants are required to attend classes three days per week—either from 9 to 11 a.m., or from 12 noon to 2 p.m. Beginners are

*(Continued on page 29)*

## RCA THEATRE SUPPLY DEALERS HOLD ANNUAL MEETING AT RECENT CHICAGO TESMA-TEDA CONVENTION



Dealers in RCA theatre supplies from all parts of the country attending the annual dealer meeting conducted by the RCA Theatre Equipment Section in conjunction with the TESMA-TEDA convention at the Hotel Stevens in Chicago. Front row, left to right: John Volkman and Duncan Phyfe, RCA theatre equipment engineers; Jack O'Brien, manager, Theatre Equipment Section; Karl Brenkert, president, Brenkert Light Projection Co. (RCA subsidiary); Homer B. Snook, president, Midwest Theatre Supply Co., Cincinnati; Charles R. Underhill, Jr., and Ralph H. Heacock, theatre equipment sales.

To the right of the aisle in the second row, left to right: Barton Kreuzer, head of RCA's Theatre and Film Recording Dept.; W. W. Watts, vice-president in charge of Engineering Products Dept.; T. A. Smith, general sales manager; Arch Hosier, St. Louis Theatre Supply Co.; C. F. Strawley and Herman Henken, Theatre Equipment Section; J. V. Buckley, J. Walter Thompson Co.; Richard Sanderson, Theatre Equipment Section.

# The Origins of the 'Magic Lantern' †

The second instalment of an article which traces the development of the modern slide projector out of the old art of "mirror-writing," a derivation of the silhouette.

By J. VOSKUIL

Research Chemist, Geldermalsen, Holland

IT MAY be imagined that the development of the magic lantern from the camera obscura had taken place after systematic research work on geometrical optics, as is the practice today. By moving the object from a point far off to the focus of the lens, and by constructing a device for optical lighting (condenser), which is a characteristic feature in a projector, one had changed the camera obscura into a magic lantern.

But in Porta's time there was no question of systematic research. All investigation was more or less guesswork, done for the greater part by adventurers and charlatans who looked for ways in which to deceive the credulous public and to make quick money. As for the very small scientific world of those days, it was interested only in the magnifying power of lenses and their use in microscopes (Hooke van Leeuwenhoek) and telescopes (Galileo).

## Genesis of Optic Projection

So the principles of optic projection were invented by way of trial and error, and in the previously-mentioned first edition of Kircher's "Ars Magna" of 1646 we can find a good starting point for the historical development of the slide projector, for on pages 907-917 we read about experiments which, traced backward, point to the "silhouette show," and on the other side directly lead to the first magic lanterns of Christiaan Huygens (1629-1695) and Thomas Walgensten.

Kircher, who was at that time in Rome, carried out these experiments because he was fascinated by the old "art of mirror-writing." From passages in Agrippa von Nettesheim's works on occult philosophy (16th Century) we learn that this art is very old, even the name of Pythagoras (500 B. C.) being connected with it.

The ancients seem to have experimented with a system of long-distance communication by writing on a plane or concave mirror which was reflected on a screen placed at some distance. Thus a kind of optical telegraphy was constructed to be used for messages to army leaders in battle or for other emergencies.

Von Nettesheim tells us the fantastic story that Pythagoras, while in Italy, in this way communicated with his friends in Byzantium. He wrote the letters with

his blood and reflected the mirror to . . . the moon!

Figure 3, b and c, shows schematically how the ancients planned—and perhaps put into practice—their "art." On a mirror, *Sp*, the reversed letters, *f*, were traced; these did not reflect the rays of the sun and thus formed shadowy figures on a screen, *S*, as reflected by the mirror. In fact, mirror-writing really is nothing but using a mirror to direct a certain shadow, *A*, to a certain spot, *b*. By using a concave mirror the ancients tried to get larger images, *c*.

We learn in the primers on optics that the shadow of an object lighted by a light of some dimensions becomes less sharp as the distance between the object and the screen grows. The inner shadow grows narrower and the penumbra broader. Consequently, the reflected writings are somewhat blurred at relatively small distance and badly blurred at greater distance.

## Kircher's Use of a 'Lens'

Now, Kircher tried to improve on this method by means of a *lens*. That he chose a lens was very probably not the result of scientific reflections but of the fact that the lens, as an optical implement, was becoming ever more popular. The 17th Century, in which Kircher lived,

(Continued on page 25)

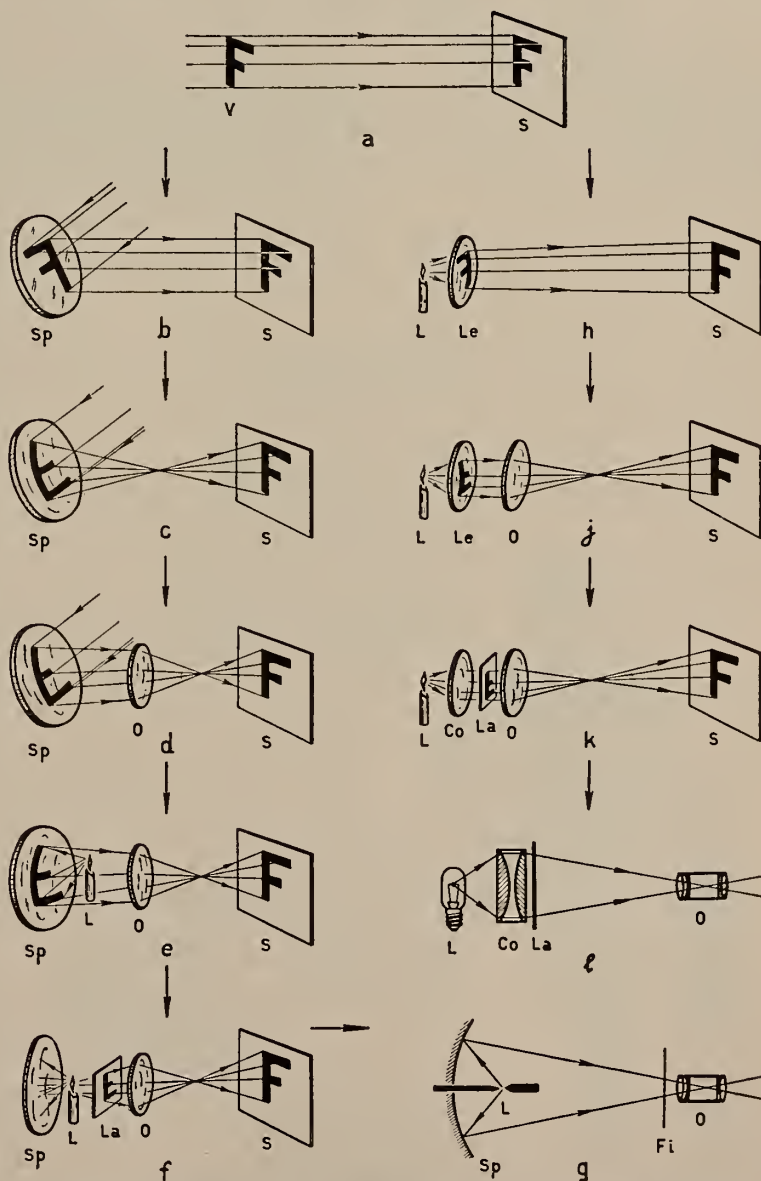


FIG. 3. Development of modern projection systems from the silhouette: *v* = object; *s* = screen; *l* = source of light; *la* = slide; *fi* = film; *sp* = mirror; and *o*, *le*, *co* = lens (*o* as objective, *co* as condenser).

† J. Soc. M. P. Eng., Dec., 1948.

## QUESTIONS AND ANSWERS ON PROJECTION LENSES

(Continued from page 16)

mented together, and two elements are single.

**ARE THE CEMENTED SURFACES COATED?**

No. Treating cemented surfaces with an anti-reflection coating would not increase the light transmission of the lens.

**ARE SNAPLITE LENSES SEALED, AND IF SO, HOW?**

All Snaplite Series II and Super-Snaplite lenses manufactured since January 1946 are of sealed construction to prevent entrance of moisture, dust or oil. This is accomplished by using a one-piece lens barrel made from a solid bar with no threaded joints. The front and the rear elements are sealed by means of synthetic rubber gaskets.

**SHOULD SEALED LENSES BE TAKEN APART?**

No, never disassemble a sealed lens. If there develops any indication that the lens need be taken apart, it should be returned to the factory for complete examination.

**WHY IS ALUMINUM USED FOR LENS MOUNTS?**

Because of its light weight, high-strength aluminum alloy is preferred to

brass for lens mounts, especially if the former is protected by anodizing. A gold anodized finish is used for Super-Snaplites, while a black finish is used for the Series I and II lenses.

**ARE PLASTIC MOUNTS USED IN SNAPLITE LENSES?**

Definitely not. The black anodized aluminum barrel has sometimes been mistaken for plastic; but we do not consider plastics as being suitable for mounting high-precision lenses.

**HOW IS IT POSSIBLE TO GET A BLURRED PICTURE WITH A GOOD LENS?**

This is usually caused either by misalignment of the entire optical system of the projector or by the lens itself not being securely held.

**MUST FAST LENSES BE ALIGNED MORE ACCURATELY THAN SLOWER ONES?**

Yes. An extremely fast lens must be held securely at all times. The lamp, projector and lens must be kept in alignment. Check by interchanging lenses between projectors.

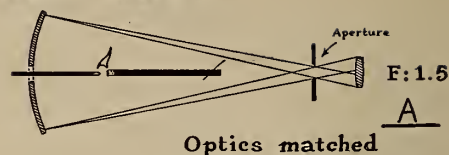
**SHOULD LENSES BE REPLACED IN HOLDERS IN THE SAME POSITION EVERY TIME?**

This is not necessary in the case of Snaplites, which are so centered that no alignment marks are necessary.

**HOW OFTEN SHOULD FOCUS BE CHECKED?**

The focus should be checked at fre-

**Mirror rated F:2.5**



**Condenser rated F:2.5**



Example: a projection lens which is matched to one lamp is not necessarily matched to another lamp having the same "speed".

quent intervals, especially after reels are changed. If after checking focus, alignment and lens holder, the lenses do not give a good picture, they should be returned for inspection.

**HOW SHOULD COATED LENSES BE CLEANED?**

Instructions on the care of both coated and uncoated lenses are generally available from either supply dealers or manufacturers. Form 66 is the Kollmorgen designation for these data.

## Altec Takes Over W. E. Sound Reproducing Activities

Altec Lansing Corp. will take over Western Electric's commercial activities in microphones, loudspeakers and disc reproducing equipment under an agreement entered into by the two companies, according to an announcement by F. R. Lack, vice-president of W. E. The agreement, which is already in effect, will assure uninterrupted service and availability of maintenance parts, Lack said. Cited among the reasons for W. E.'s decision to withdraw from the field were the continuing specialized needs of the Bell Telephone System and the expanding requirements of the armed forces for the development of complex electronic equipment essential to the nation's defense.

### Distribution Continues Thru Graybar

Graybar Electric Co. will act as distributor for Altec, as it has for W. E., in the sale and servicing of the type of equipment concerned. Among the products affected will be the 109 reproducer series, the 633 and 639 types of microphones, and the 728, 755 and 757 types of loudspeakers used extensively in broadcasting and high-quality sound system applications.

Altec was founded in 1937 to carry on the theatre servicing activities of Electrical Research Products, Inc., at that time a subsidiary of W. E.

Commenting on the W. E. announcement, G. L. Carrington, president of the Altec companies, said:

"This development will enable both Altec Service and Altec Lansing to round

## ANSWER TO YOUR TECHNICAL PROBLEMS . . .



The  
Altec  
Service  
Man

*The Altec  
Service Man and  
the organization  
behind him*



161 Sixth Avenue,  
New York 13, N. Y.

PROTECTING THE THEATRE—FIRST PLACE IN ENTERTAINMENT

out and expand their interacting activities, not only in the motion picture field but in the audio industry generally. The addition of these splendid W. E. products to our present line of sound apparatus enables Altec to supply all branches of the audio industry with their essential technical equipment."

### TESMA-TEDA Convention Tops

Three thousand people, 87 companies occupying 110 booths for the display of every conceivable product which constitutes the modern motion picture theatre, a flood of confidences and conviviality marked the 1949 joint convention of TESMA (Theatre Equipment Supply Manufacturers Association) and TEDA (Theatre Equipment Dealers Association) held in Chicago the last week in September.

Evidence that "the show's the thing" is no longer "gospel" was abundant on all sides as for the first time in motion picture history mere incidentals to the presentation of a picture on a screen far outnumbered the purely technical and time-honored units devised for the showing of motion pictures. Popcorn? Yes, multiplied manifoldly.

The spirit of the gathering over-all seemed to be that if the theatre were kept appealing in terms of a community center, with convenient and eye-appealing appointments playing a major part in gaining and holding such prestige, the movies had very little to worry about in terms of competitive amusements—including television with a capital T.

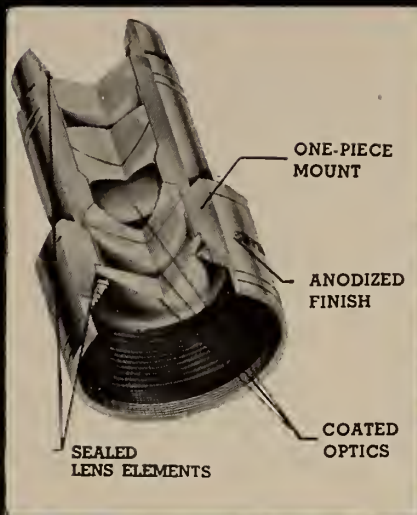
Oscar F. Neu, president of Neumade Products Corp., was re-elected president of TESMA. J. R. Hoff, Ballantyne Co., was elected vice-president, and Roy Boomer was re-elected secretary and treasurer.

Named to the board of directors were: L. W. Davee, Century Projector Corp.; H. B. Engel, GoldE Mfg. Co.; L. S. Jones, Neumade Products Corp.; W. D. Matthews, Motiograph, Inc.; V. J. Nolan, National Carbon Co., Inc.; J. F. O'Brien, RCA; H. H. Strong, Strong Electric Corp.; E. J. Vallen, Vallen, Inc.; E. Wagner, Wagner Sign Service, Inc.; F. J. Wenzel, Wenzel Projector Co.; C. S. Ashcraft, Ashcraft Mfg. Co., and W. A. Gedris, Ideal Seating Co.

Ray G. Colvin was elected executive director of TEDA. The position of president, formerly held by Colvin, was replaced with the new office to which he was elected. Tom Shearer, B. F. Shearer Co., was elected chairman, a position which replaces the former vice-presidency.

Elected to the executive committee were: F. A. Van Huse, Western Theatre Supply; Joe Hornstein; W. E. Carrells, Fall City Equipment Co.; John P. Filbert; Ray Busler, United Theatre Supply Co.; Jack L. Rice; H. J. Ringold, Ringold Theatre Equipment Co.; K. R. Douglas, Capitol Theatre Supply Co.; J. Eldon Peek, Oklahoma Theatre Supply Co.; Ernest Forbes; Nash Weil, Wilkin Theatre Supply, and Henry Sorenson, Modern Theatre Equipment Co.

## f/1.9 SUPER-SNAPLITE



*Question Box*

No. 9

### DOES THE F/1.9 SUPER-SNAPLITE HAVE A TRUE SPEED OF F/1.9?

Yes—in all sizes from 2" up through 4¾". The 5" size has a speed of f/2.0.

### WHY DOES THE 5" SUPER-SNAPLITE HAVE A DIFFERENT SPEED FROM THE SHORTER FOCAL LENGTHS?

Because of the limited space in the projector. In other words, a 5" lens with a speed of f/1.9 would not fit into present projectors because of the large diameter needed for the lens barrel.

### DOES THE SUPER-SNAPLITE LENS HAVE DIAPHRAGMS?

No—the full aperture is utilized in all focal lengths.

### DOES A FAST LENS ELIMINATE THE "HOT SPOT"?

To a very large extent. The faster the lens, and the higher its quality, the more uniform the screen illumination will be.

### IS THE "HOT SPOT" WORSE WITH SHORT FOCAL LENGTH LENSES?

Usually. The falling off in illumination at the corners can be quite severe with poor lenses. This problem was given full consideration when Super-Snaplite lenses were designed. Even in the shorter focal lengths, they give remarkably even screen illumination.



"You Get the Most Uniform Light with Super-Snaplite"

**KOLLMORGEN**

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Brooklyn 11, New York

*Optical*



**CORPORATION**

## IP TELECASTS

(Continued from page 17)

roster of talent." It will also supply "live" films tailored specifically to meet Tv's needs. Par is also offering its services as film buyer to interested stations.

\* \* \*

### Battle on Color Tv Systems Rages Before the FCC

The nation's Tv set makers hope to come up eventually with a color Tv receiver that would sell for only \$49.95, said R. C. Crosgrave, president of the Radio Manufacturers Association, in a recent hearing before the Federal Communications Commission. He added, however, that color Tv never would replace black-and-white, thus any color system that was approved should protect set owners against having to buy costly converters or adapters.

"As manufacturers," said Mr. Crosgrave, "we would like to have color standards set as soon as possible. If you could

do it tomorrow, we could get off our uneasy seats. We are scared to death about the probable need for costly converters and adapters."

### RCA Not Ready on Color Tv

The FCC has been asked to add 42 new Tv channels to the 12 b-and-w channels now available. The two systems now receiving the most attention are the electronic system developed by RCA and a mechanical device developed by Columbia Broadcasting. RCA asserts that with its color system present set owners could receive the color images in b-and-w without altering their receivers; or they could receive color by buying an inexpensive converter.

FCC members pounded away at the RCA research director, Elmer W. Engstrom, who had the unpleasant task of announcing that RCA was not quite as ready with color Tv as its announcement of last August had indicated. FCC Chairman Coy asked if it were not true that RCA was willing to take a much greater risk on b-and-w than on color Tv.

Coy declared, one year to the day from his announcement of the freeze on Tv, that the FCC "didn't do too well on b-and-w Tv," and that it was unwilling now to rush ahead on color. When Engstrom remarked that progress had been good on b-and-w, Coy replied, "We've had to stop and revise it, haven't we?"

Commissioner Frieda B. Hennock indulged in some blunt talk with Engstrom. "Don't kid us," she said; "let's call a spade a spade on this color thing. Why don't you help us?" She added that she and the FCC are not willing to take the blame because RCA is not prepared, following Engstrom's admission that RCA is months away from actual commercial production of equipment for its color Tv system.

"Color has been in the process for 20 years," said Miss Hennock, "but every time we want something it's next Spring, or next year or five years from now. I don't believe you want color."

### SMPE 66th Meeting on Coast

More than 300 motion picture engineers, including six from Europe, gathered October 10 at the Roosevelt Hotel, Hollywood, for the 66th Semi-Annual Convention of the Society of Motion Picture Engineers. Technical sessions, extending over a five-day period, were marked by the presentation of a record number of papers and demonstrations, with television, color photography, and high-speed photography the major areas of the Convention's reviews.

Other discussions were concerned with studio lighting, lenses, new film emulsions, sound recording, including magnetic tape; new film processing procedures, and related subjects.

As soon as these papers become available to the industry generally by virtue of their publication in the *SMPE Journal*—which period may range upward to six months—IP will publish such meager data relating to the field of visual and sound reproduction as has been the norm for the past four or five SMPE meetings.

### New Ampro Magnetic Tape Recorder

An entirely new type of magnetic tape recorder and playback unit at a record-breaking low price is announced by Ampro Corp., Chicago. Based on an entirely new electronic circuit which drastically reduces size, weight and cost, this recorder is the first such complete unit to sell for less than \$100—retailing for \$94.50.

Weighing only 15 pounds and, in inches, only 8 x 8 x 11, this recorder is truly portable. It uses standard recording tape and records on a "dual tape" on either 5- or 7-inch reels at 3¾ inches per second tape speed. A full 2-hour program can be put on a single 7-inch reel of tape.

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## THE ORIGINS OF THE 'MAGIC LANTERN'

(Continued from page 21)

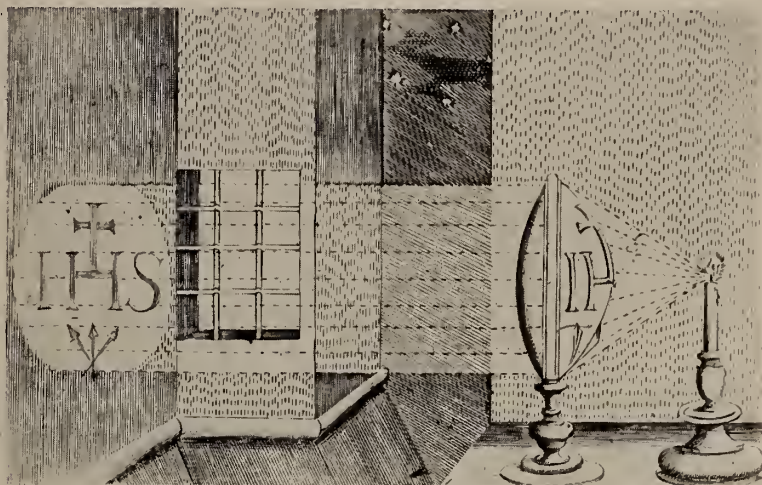


FIG. 4. Bettini's shadow projection with the lens (1642).

was the period of the rise of optical science and practice.

Snellius (1580-1626) had worked out his well-known law of refraction by which a rational construction of optical instruments had become possible. Huygens and, later, Isaac Newton (1642-1727), published their famous treatises on the nature of light and, moreover, constructed different optical apparati.

The study of microscopical objects and celestial bodies went through a "boom" period, and so it can be easily understood that minor scientists like Kircher tried the lens as an improvement for their optical devices, asserting priority when they had made an "invention." Moreover, Kircher had read about experiments of another Jesuit, Marius Bettini (1582-1657) which, according to Kircher, might be very useful for his research.

Bettini's experiments can be found on pages 26 and 27 of the "Apiaria Universae Philosophiae Mathematicae" (1642), which, freely translated, means "a miscellany of mathematical philosophy." Under the heading "Shadow Projection With the Lens" (Fig. 4) Bettini dealt with a "secret method with which, during the night, one can communicate with a friend in another place with the aid of a hyperbolic lens, painted figures, and a source of light." The figures had to be made of materials which did not affect the polished surface of the lens—wax or clay, for instance.

### First Primitive Condenser

It must be noted that the lens did not project an image of the figures. These appeared—as was the case with the figures on the mirror—as *shadows*. But the lens did achieve a concentration of the light, and we may consider it as the

first primitive *condenser*. The "hyperbolic" lens existed only in the fantasy of its inventor, because the grinding of this kind of lens, even with modern tools, is practically an impossibility. So much for the experiments of Bettini, who was

able to perform "the art of mirror-writing" at night.

The first thing Kircher did was to extend the distance between the mirror and the screen, because, as he wrote, "it was hardly 20 steps. . . ." He did this by placing a lens in the reflected rays which produced a sharp, enlarged and inverted image on the screen (Fig. 3, *d*, and Fig. 5, the latter shown on page 27.)

The plane mirror had a diameter of 4 cm. and a lens of 3 cm. Fig. 5 (a copy of the picture in the "Ars Magna" of 1646) would seem to indicate that the lens was of rather a large focal length. For it must be noted that the distance between the mirror and the lens is rather long, and that the enlargement on the screen is rather small. Considering the technical possibilities of the 17th Century, this was the only means of avoiding spherical and chromatic aberrations. Kircher first projected tests which now "were clearly visible at a distance of 500 feet."

With two assistants (Kasper Schott—"Magia Universalis Naturae et Artis"—and Georgia de Sepi, who acted as an instrument maker) Kircher pursued his experiments. The mirrors were made of a special alloy because normal steel mirrors were affected by the ink. Nor

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were glass mirrors of any use, as the double reflection of the light rays produced a blurred image.

It was found that concave mirrors worked better than plane ones, understandably, as the concave mirror reflects the rays in a *convergent* bundle on the center of the lens and so produces a sharper image than the plane mirror, where the rays reflected in the margin of the lens are more refracted than those which are transmitted nearer the center (Fig. 3, *d*). Further, as mentioned previously, it was very important to have a well-ground lens which had to be spherical or, better still, "hyperbolic."

### The First Moving Pictures

The many performances which were given by Kircher and his assistants excited a lively interest and made a profound impression. Texts were first projected, then the dial of a clock which was painted on the mirror with a pointer made of paper indicating the correct time.

Later, geometrical line drawings, filled

in with transparent paint, were projected, and Kircher was surprised at the fact that the colors appeared unchanged on the screen. Pleased with this kind of projection, he relieved his feelings in circumstantial treatises.

The experiments went on. Right in front of the mirror a cardboard puppet was placed, the limbs of which could be moved by invisible threads.

The spectators saw the first moving pictures!

Then a fly was fixed on the mirror with honey, and a terrifying monster appeared on the screen. By sticking a needle into the fly and moving a magnet behind the mirror (which in this case could not be made of iron) it looked as though the fly moved and were alive. This apparatus may be considered one of the first primitive solar microscopes.

The spectators were profoundly impressed by this performance, and the "moving pictures" even frightened them. However, Kircher was not yet satisfied. The public had to be impressed much more, and the idea occurred to him that this might be achieved if the performance were given at night.

Now he had to work with an artificial source of light: a burning candle was chosen which was placed in front of a concave mirror, because a plane mirror would only reflect part of the divergent rays into the lens (Fig. 3, *e*).

### Water-Filled Flasks Used

Not always having the correct concave mirrors at his disposal, Kircher invented another device. Thinking of Bettini's method with which he had experimented before, Schott wrote about this "third art":

"I have tried it with Kircher and it came out well"—the concave mirror was substituted by one of those rather large spherical flasks filled with water which, in the 17th Century, were on hand in all sorts and sizes and were used by physicians as "urine receptacles."

The drawing or text was fixed or painted inverted and reversed on the water-filled flask at the side turned to the projection lens, but as the surface

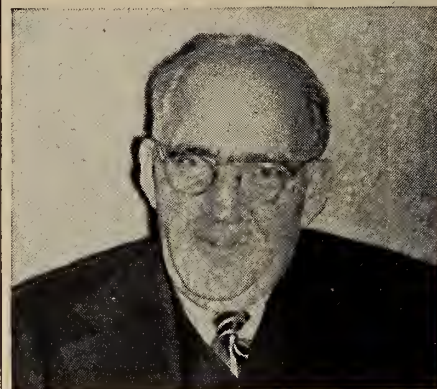
of the flask was spherical, it was not possible to focus all points of the figures on the screen, and the image as a whole remained blurred (Fig. 3, *j*).

Remarkably, Kircher, instead of using a second lens, chose a flask. We may draw the conclusion, therefore, that lenses still were rare in the 17th Century. Thus we may consider the device of Fig. 3, *e*, as the first primitive projector with the *reflector lamp*, *g*, and the device of *j* as the first with a condenser. *l*.

As the light of a candle is very feeble compared with that of the sun, only figures and short words as "pax" and "salve" could be shown, but the influence of the darkness on the spectators was so undeniable that the simple words made

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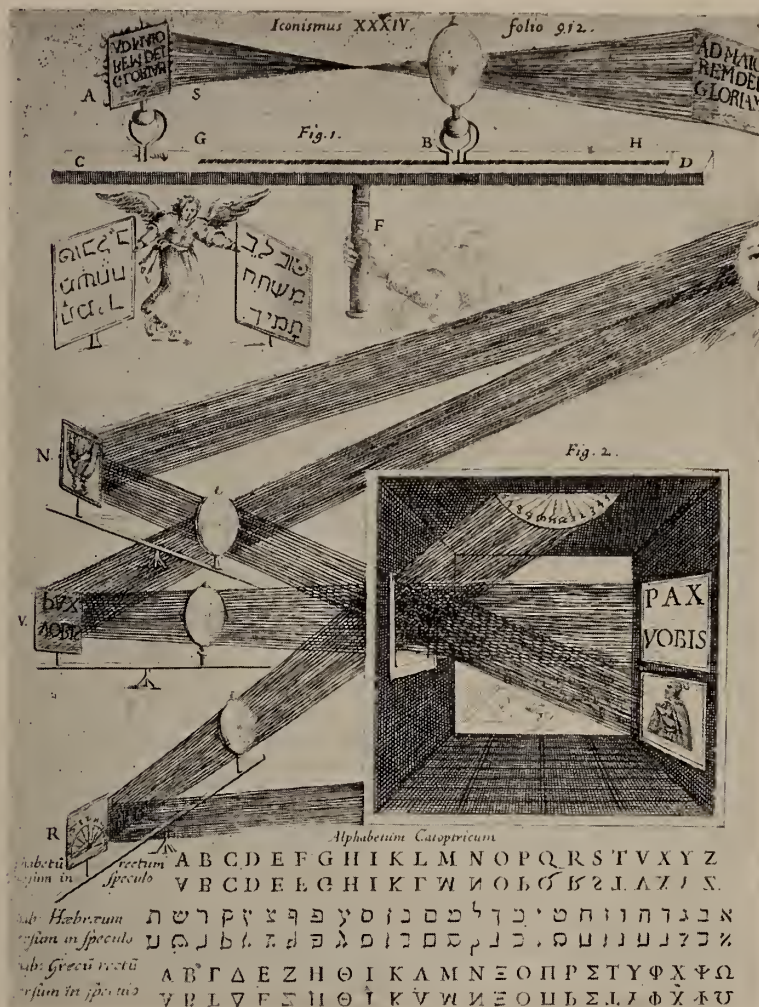


FIG. 5. Kircher's projection methods as an improvement of the old art of mirror-writing (1646).

a more profound impression than did the moving puppet in the sunlight.

#### Religious Angle Stressed

Kircher considered this kind of projection a very useful means to convert godless people. Therefore he took great pains to project on the windows of houses in Rome, the window panes in those days being of paper. We may imagine the feelings of the sinful Roman citizens when suddenly they saw the bright figures in the darkness and supposed an ominous resemblance with the "Menetekel . . ." of King Belshazzar.

Schott wrote in his "Magia Optica" (one of the volumes of the "Magia Universalis") that "these performances of images in darkened places were more alarming than those in the daylight." By this art godless people might easily be kept from committing sin, especially if one should fix a picture of the devil on a mirror and project it in a dark place. It is a pity that such views have hampered the development of the projection lantern.

When the profound seriousness of the priests vanished, the "laterna magica" remained in the hands of charlatans and necromancers who used it to impress simple and superstitious minds. During almost two centuries the lantern had only been used to project terrifying figures and for other mysterious purposes.



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The development toward an instrument for the use of scientific instruction and education was for this reason hampered until about 1850.

#### Tacquet's Lantern Lectures

In the 17th Century, however, there was somebody who, in Kircher's improved art of mirror-writing, saw not only an instrument of wonder but something more. It was the Belgian Jesuit and mathematician Andreas Tacquet of Louvain (1612-1660) who was the first to give a lantern lecture. He had met Friar

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and 13.6 mm. x 22" (machined for adapters) to provide 20 minutes more burning time.	

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Martin Martini, a Jesuit missionary, who had undertaken a dangerous journey to China and, after his return to Louvain (1653) visited Tacquet and planned to lecture upon his adventures.

Tacquet, acquainted with Kircher's method of projection (probably by having read the "Ars Magna") realized how Martini's lectures could gain an importance if they were accompanied by projected illustrations. Thus it happened that during Martini's narrative, before the eyes of the interested and astonished

spectators, pictures of foreign countries and peoples appeared which seemed to come out of nothing and also vanished into nothing.

[To be Concluded]

## NEWS PROJECTIONS

*Jottings of happenings which, while mostly of a non-technical nature, have a bearing upon general industry welfare and progress.*



MRS. ANN R. KANTNER—Manager, New Pittsburgh Drive-In Theatre, Turtle Creek, Pa.—says:

"In our business sound is important. So it's RCA 100 %."

To get the benefits of RCA Service—write: RCA SERVICE COMPANY, INC., Radio Corporation of America, Camden, N. J.

ESTIMATES say approximately 10% of next year's total feature production will be done abroad—35 such already set—despite the anguished outcry of Hollywood technicians. . . . Paramount winds up with nine of the 50 theatres in the Malco Circuit, Memphis, divestiture deal. . . . Total gross of first-run theatres in Los Angeles area for 1948-49 season off only 5 2/3% from preceding year. . . . Paramount retains only three of the 15 theatres in the Dominion Theatres, Virginia, splitup. . . . Magnitude of theatre concession sales revealed by TOA announcement that \$500 millions is annual take for popcorn, candy, etc.

In-car speakers with heating attachment have old-line exhibs worried that drive-in season will be considerably prolonged and cut deeply into regular theatre biz. . . . Double-barreled blast at U. S. equipment manufacturers through devaluation of various currencies abroad. U. S. units set down on foreign shores now cost 43% more; while a British projector landed here, for example, bears a price tag 20% less. One large exporter of projection equip-

ment informs IP that concern centers not so much on current business drop abroad as that U. S. loss will be "permanent as foreign manufacturers move in." . . . New big-town, first-run policy of feature and a condensed version of musicals not over five years old getting test in Eastern cities.

Complete separation of distribution and exhibition organizations currently controlled by Fox, Loew's and Warners within 18 months was asked by Dept. of Justice in proposed final judgment submitted in the industry-wide anti-trust suit. Government also wants to have right to "police" the final judgment. . . . Clifton Webb rated as top box-office draw in pictures today, due to his "Mr. Belvedere" series. . . . Drive-in theatres expected to number one out of every eight motion picture theatres in U. S. within two years. . . . Cost of living generally has risen 31.6% since 1945, reports the U. S. Bureau of Labor Statistics, while movie theatre admission prices have increased only 10 1/2% in same period.


Distributors finally forced by exhibitor complaints from all over the country to increase print orders on releases by about 30% . . . Paramount will install its intermediate Tv system in the Metropolitan, Boston. . . . CBS has recently completed huge Hollywood studio for production of several shows on films which will subsequently play Tv stations throughout the country. . . . Picture company profits: Columbia for year ending June 30 last earned \$1,07,000 net; Republic for 39 weeks ended July 30 earned \$730,116.

Ignoring obvious dissatisfaction of paying patrons, Fox has just announced reissuance of 10 old features. Exhibitors who play this stuff without explicit notice of their character are hurting this business. . . . Paramount is inviting offers for the stock it holds in the W. S. Butterfield Theatres and the Butterfield Michigan Theatres Co., involving 113 houses in Michigan. Par's holdings in both companies approximate 30%.

### Community Chest Appeal by President of A. F. of L.

I am pleased to add my personal approval to the official endorsement of the American Federation of Labor for the Community Chest campaigns. It is a most significant and a highly important fact that representatives of labor, management and professions have been called upon in most cities and towns to serve on budget and campaign committees, as well as on Boards of Directors, of local Community Chests and Red Feather services. This is a most convincing example of democracy in action.

WILLIAM GREEN



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the movie-goer  
responds to how he sees and  
hears in your theatre.  
Install CENTURY PROJECTION  
AND SOUND SYSTEMS for  
harmony of color tone and  
picture brilliance.

*Sold through recognized theatre supply dealers*

**CENTURY PROJECTOR CORP.**  
NEW YORK, N. Y.

## IN THE SPOTLIGHT

(Continued from page 20)

taught basic electronics, while courses in practical shop work, including tele servicing and installation, are available to advanced students. These classes are formed under the supervision of Frank Inciardi, educational director for Local 306.

• W. B. Clark, former president of Local 599, Fresno, Calif., was presented with a lifetime membership card. Clarke has held every office in the Local since he became a member in 1917, and for ten years prior to his retirement in 1947 he held the office of president. The presentation was made at Clarke's home, where he has been confined to his bed since the early part of the year.

• In an official NLRB count of 36 to 0, the movie set decorators voted in favor of IATSE representation. This small group set off the spark that ignited the long bitter Hollywood strike about four years ago when Herbert Sorrell, business agent of the Brotherhood of Painters, Decorators and Paperhangers of America, sought to gain control of the film industry. A majority of the 36 decorators who voted in the NLRB election were former supporters of Sorrell.

• Seen here and there at the TESMA-TEDA Chicago convention: Barney Pearlman, former sales manager for GoldE Mfg. Co., and one of the best liked men in the industry . . . George Raasflaub, secretary of Syracuse Local 376, our sidekick on the plane flight to Chicago, crammed up on a lot of tele dope. His report to the Local should be a very interesting one . . . Jack Behlke, member of Chicago Local 110 and field man for



J. A. CHRISTENSEN—Owner and Manager, Arcade Theatre, Salt Lake City, Utah—says:

"Sound service is essential for patron satisfaction. For many years RCA Service has done an excellent job for us."

To get the benefits of RCA Service—write: RCA SERVICE COMPANY, INC., Radio Corporation of America, Camden, N. J.

Motiograph, gained many new friends for his company by his courteous and unflinching willingness to answer the questions of the many visitors to the Motiograph . . . About 650 people attended the National Carbon Co. cocktail party, which was held in the Normandie Lounge of the Stevens Hotel. On hand to welcome the visitors were the following National representatives: C. O. Kleinsmith, Dave Joy, W. J. Nolan, Paul Reis, C. E. Heppberger, Erwin Geib, Dr. W. W. Lozier, and, of course, none other than National's old standby—Bill Kunzmann, who was largely responsible for the success of the party. A newcomer to these affairs was F. S. Haggerson, sales manager of carbon products for NCC . . . Missed at the Motiograph headquarters was the cheery smile and ready wit of Mrs. Thor (Pat) Matthews, who was confined to her bed with a cold . . . The IA was represented by projectionists from all parts of the country—Louis Wutke, Los Angeles Local 150; Wallace Yutzy, Minneapolis Local 219; Gene Muller, San Antonio Local 407; J. Williams, Memphis Local 144; Fred Parker, Rock Island Local 433; a large delegation from Milwaukee Local 164 (mentioned elsewhere in these columns); and, of course, Chicago Local 110 members.

## IA ELECTIONS

### LOCAL 440, ST. JOHN, N. B.

A. C. SPRAGUE, pres.; L. J. McCourt, vice-pres.; C. BEESLEY, sec.; A. T. WEDGE, treas.; JAMES A. WHITEBONE, bus. rep.; NORMAN PETERS, L. SPRAGUE, ED CHASE, trustees.

### LOCAL 373, TERRE HAUTE, IND.

M. B. LINK, pres.; E. F. KIRK, vice-pres.; GEO. H. FAGG, sec.; E. F. BROWN, treas.; B. STEINHAUSER, bus. rep.; C. B. KNOTT and T. A. WHITE, executive board members.

### LOCAL 604, CORPUS CHRISTI, TEX.

HERMAN BRIDGERS, pres.; T. W. RICH, vice-pres.; LEO BECKLEY, sec.-treas.; D. A. BRANDON, bus. rep.

## Forty-One Years Ago

Middleport, N. Y. Frowns on Movie Shows

An edict has been passed by the city fathers of Middleport that moving picture shows are a menace to women and children who patronize them, and, consequently, all efforts by a party of Medina men to establish a nickelodeon here within the past few days have failed.

Moving Picture World, May 16, 1908

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## FIRE EXTINGUISHERS IN PROJECTION ROOMS

(Continued from page 12)

monoxide is a combustible, highly toxic gas; while the dioxide is incombustible and quite non-poisonous.

Not only is carbon dioxide non-poisonous, but it is essential to the existence of life on this planet. The gas is present in the atmosphere to the extent of 0.03% to 0.04%—much more in large cities. Without CO<sub>2</sub> in the air there would be no plant life. Plants breathe CO<sub>2</sub> and exhale oxygen. Animals breathe oxygen and exhale CO<sub>2</sub>. All the oxygen in the earth's atmosphere is the breath of plants. There is probably no plant life on Venus because the atmosphere of that planet is mostly CO<sub>2</sub> with little or no oxygen; but the atmosphere of Mars is like that of the earth though thinner, hence it may be assumed that there is vegetation there to maintain free oxygen in the Martian air.

Carbon dioxide is present in exhaled human breath to the extent of 4.4% by volume. This gas also comprises 45% of the total volume of dissolved gases in venous blood, and 38% in arterial blood.

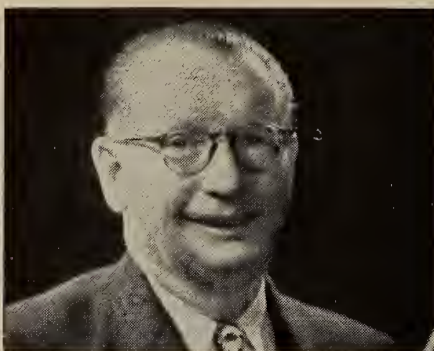
It can therefore be understood that CO<sub>2</sub> is not a poison. It can take life only by excluding oxygen from the lungs. But the gas is not without physiological effect: it stimulates the respiratory centers. In fact, the standard gaseous mixture administered to victims of gas poisoning consists of 93% oxygen and 7% carbon dioxide to increase the rate of breathing.

Very high concentrations of CO<sub>2</sub> are required to produce suffocation; and before death can occur, the ensuing stimulation of the respiration causes discomfort and forces the victim to seek fresh air. The victim is not "overcome" in the sense that he loses consciousness without ever having realized the danger of suffocation and the urgent need for oxygen. Can you imagine a projectionist gasping for breath while using a CO<sub>2</sub> extinguisher and not having sense enough to open the door or else leave the room?

### CO<sub>2</sub> Use for Film Fires

The only danger in using a CO<sub>2</sub> extinguisher for putting out film fires is that the user may have a little too much confidence in it and get burned or poisoned by the fumes of burning film. I cannot now advise any projectionist to fight a film fire; but those intrepid would-be heroes who insist on showing off are advised to use *nothing but* a CO<sub>2</sub>-type extinguisher.

The jet of liquid CO<sub>2</sub> from the tank freezes to a solid snow of "dry ice" which



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is cold enough to put out all but the fiercest projection-room film fires. It would be ridiculous of a person to fear being suffocated by the CO<sub>2</sub> gas evolving from the dry ice. Rather, he should fear bad effects from the smoke of the film fire.

Regardless of what Eastman Kodak says about film burning under water (p. 14 of IP for September), most celluloid factories rely on nothing but water to combat fires which may occur. I once

set a full 2000-foot reel on fire outdoors and put it out by simply throwing a bucket of water on it. I should like to try dropping a blazing reel into a tub of water, but I have only a few reels of my own left, and I want to keep them for use as test films. If someone will donate the film, I'll conduct any sort of extinguishing experiment they wish.

Water, to be effective, must be applied in a powerful, continuous stream. Sprinkling systems are of no value because they do not apply sufficient water to cool the film *below the ignition temperature*.

### Carbon-tet extinguishers are worthless and extremely dangerous.

Soda-acid extinguishers are useless because the jet is too fine to have any cooling effect. Foam-type extinguishers may cause a disastrous explosion of celluloid degradation gases. Both these types of fire-fighting devices may ruin the projection equipment and cause electrical fires by short-circuiting wiring.

Mr. Stewart failed to identify the "other and more efficient" extinguishers. I have never heard of such, but I am very desirous of learning what they may be. Why not solicit further contributions on this subject from Mr. Stewart? I should like to think over any other ideas he may have. Personally, I should almost advise against *any* type of extinguisher in projection rooms; but, on the other hand, a small roll of film might ignite which the projectionist *could* extinguish with a CO<sub>2</sub> extinguisher.

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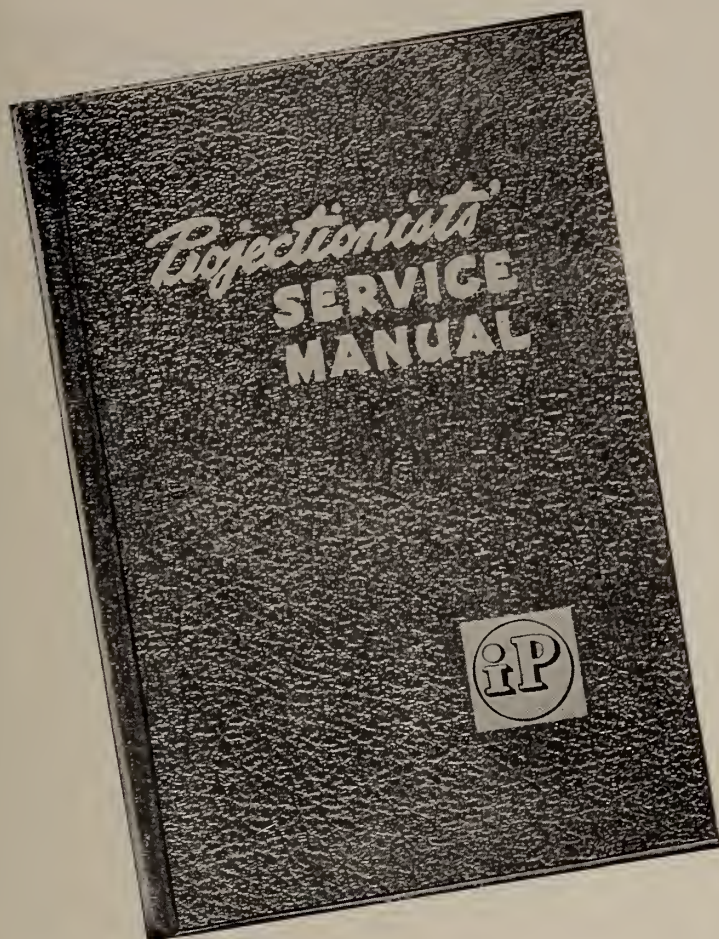
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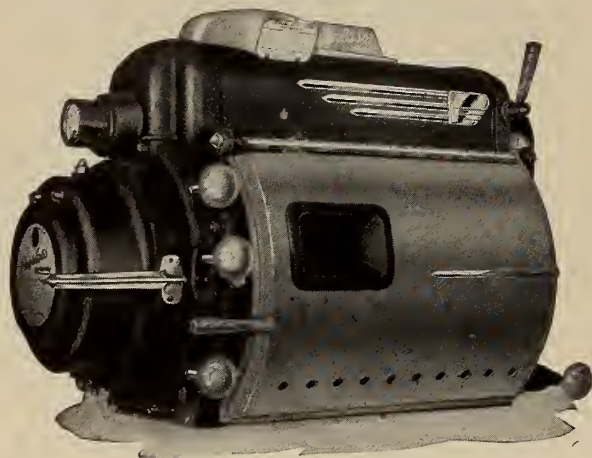
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# *Your Local Union is Your Only Security*

---

## High-Court Ruling on Local Rights

THIS is one of the most important stories that IP has ever printed, because it bears directly upon the personal security of every man who, having joined an organization such as an IA Local Union, looks to that organization—"family," if you will—to protect him in his livelihood. These are not only the implications but the *considered judgment* of the Supreme Court of the State of California in overturning the decision of a lower (Superior) court which had ruled that a Local Union must continue to give employment to an outside card-member of the same International.

Most important we think is the fact that the decision of this highest State court directed that even had the Local Union acted arbitrarily (not sustained by the evidence), it still would have been within its *legal* rights in refusing longer to honor the filed working cards of *outside* members of the same International.

The facts in this case are simple—but the implications are of tremendous importance to every man who carries a card, whether in the IA or any other labor union. These are the facts:

Two IA members (who shall be nameless) journeyed to San Francisco and, having deposited their cards with Local 162, were given employment. There was no question of their competency; in fact, they worked for months on given jobs; but they suddenly decided that by reason of the fact that they had worked in the Local 162 jurisdiction for that given period, they were entitled to full membership in the Local.

Despite the fact that these men had

By HARRY SHERMAN

never made formal application to Local 162 for full membership, they suddenly withdrew their cards and addressed a grievance complaint to the International office in New York City—this, mind you, without a warning of any sort (even verbally) to Local 162. The IA General Office promptly, and properly, referred the communication back to Local 162.

### *The Inevitable Lawsuit*

What happened next is easy to guess—a lawsuit to compel Local 162 to admit these casuals to full membership rights. The basis of the legal action? The fact that the men had demonstrated their competency on a regular projection job in Local 162's jurisdiction.

Into Superior Court they went; and

they scored mightily by coming up with a decision against Local 162. But this was not the last inning, by far. An appeal was taken.

Upon appeal, the California Supreme Court ruled that jobs, as such, were not vested in an *individual* but in the *organization* which, by joint action over a period of time, had established standards of work and means for the protection of those men who had contributed to the building-up and continuing progress of their own organization. Nobody from hundreds of miles away was properly entitled to participate in the benefits of this careful, painstaking work over the years simply because he held a card in the same International.

That is the sum and substance of this far-reaching decision: local autonomy prevails, because it was the brawn and

---

## *IA Constitution and By-Laws (Article 17)*

### *Right of Appeal*

SECTION 1: Any member aggrieved by the decision of the tribunal of this Alliance may appeal his case in the following order: (1) from the decision of the Local Union to the International President of this Alliance; (2) from the decision of the International President to the General Executive Board; (3) from the ruling of the General Executive Board to this Alliance in the convention assembled, and the latter body shall be the tribunal of

ultimate judgment. However, in the interim, rulings of any proper tribunal of this Alliance shall be enforced pending disposal of appeal.

### *Exhausting Internal Remedies*

SECTION 7: The members of this Alliance further consent to be disciplined in the manner provided by this Constitution and By-Laws, and under no circumstances to resort to the civil courts until all the remedies therein provided shall have been exhausted.

brains and guts of the Local fellows who went out and turned the trick in the first place—the trick of organizing and fighting and battling and worrying that *they* would have a job to go to tomorrow—not somebody 1000 miles removed.

We want to say something very nice about the officials of Local 162 who invested their nerve, their money and their courage in this hard-hitting fight, a fight that was won not alone for Local 162 but for every man who carries an IA card.

Thank you, from the bottom of the well.

So that every card-holding member of the Alliance may be fully informed as to the importance of this decision to his own personal welfare, we are appending excerpts from this noteworthy decision.

**LABOR UNIONS—MEMBERSHIP.** Whether or not a labor organization is arbitrarily closed to a particular worker depends on the facts of each case, and in a mandamus proceeding by out-of-state members \* \* \* to compel a local union to admit plaintiffs to membership, it is the *plaintiffs'* burden to prove that they are *entitled* to membership, that membership is closed to them, and that it is *arbitrarily* closed.

A labor union is not *compelled* to admit all persons as a condition to maintaining closed-shop agreements, and it *has the right* to reject or expel persons who refuse to abide by any reasonable regulation or lawful policy adopted by the union.

Moving picture projectionists who are members of out-of-state unions are *not* entitled to a writ of mandate to compel a local union to admit them to membership where they have not applied for membership and have not complied or offered to comply with reasonable requirements imposed by the union as conditions for obtaining membership, *even if the evidence establishes* that any application for membership would have been *arbitrarily* rejected.

Projectionists who are members of out-of-state unions do not have an *absolute right* to be admitted to a local union as transfer members, even though the constitution of the International union compels a local union to issue transfer cards to its members, where the constitution of the International union recognizes the *right* of the local union *to which the card is presented* to reject the applicant, and where there is nothing therein which forbids the practice adopted by the local union of requiring *outside* men to meet some or *all* of the qualifications required of new members.

It is not improper or contrary to public policy for a local union to require that an out-of-state member file an application and submit to a re-examination of his qualifications as a condition for membership in the local union, and the mere fact that he might have *originally* complied with the requirements of the International union at the time he joined his *home* union, does not mean that he still meets those requirements, nor indicate that he can and does meet other reasonable requirements imposed by the local union.

In a mandamus proceeding by out-of-state

members to compel membership in the local union, evidence that one plaintiff and a third person presented their transfer cards to the local union, but were notified that their cards had been rejected *without prejudice* to their right to become members by the application method, would not justify or require affirmance of a judgment granting the writ of mandate.

**LIABILITY FOR CAUSING LOSS OF EMPLOYMENT—DAMAGES.** In an action by out-of-state members against a local union for general damages for alleged loss of wages and for exemplary damages for alleged conspiracy to deprive plaintiffs of their employment as projectionists, the court's refusal to grant damages could not be successfully attacked on the theory that plaintiffs were forced to leave their work where the evidence supported a finding that it was *not* true that a *conspiracy* existed, or that fraud, malice, intimidation or coercion was practiced by defendants to deprive plaintiffs of their livelihood as motion picture operators or of their membership in the International union, or to deny them admission into the local union.

**LIABILITY FOR CAUSING LOSS OF EMPLOYMENT.** In an action by out-of-state members against a local union for general damages for alleged loss of wages and for exemplary damages for alleged conspiracy to deprive plaintiffs of their employment as projectionists, the court's refusal to grant damages

could not be attacked on the ground that plaintiffs were *not dispatched* to work as outside members, where the constitution of the International union provided that outside men must keep their working cards on deposit with the local union, and plaintiffs admitted that they had *picked up their working cards*.

**LIABILITY FOR INTERFERENCE WITH RIGHT TO WORK.** If out-of-state members of a union were *qualified* for full membership in a local union, but the local union arbitrarily denied them admission and at the same time refused to permit them to work without belonging to the local union, the out-of-state members would be entitled to recover damages for wrongful interference with their right to work.

In an action by out-of-state members against a local union and its officers for general damages for alleged loss of wages and for exemplary damages for alleged conspiracy to deprive plaintiffs of their employment as projectionists: where the trial court's findings showed that plaintiffs' earnings were greatly reduced after they stopped working in the jurisdiction of the local union, but no findings were made relating to plaintiffs' right to damages on the theory that the reduction in their earnings was caused by a wrongful interference with their right to work, the denial of damages, at least in the absence of findings on the matter was inconsistent with the court's conclusion that plaintiffs were entitled to *full membership*.

## Multiple 16-mm Soundtrack in J. A. Maurer Version

**I**N an interesting variation of an old principle, J. A. Maurer, Inc. has introduced a 16-mm sound track in which the familiar bilateral type of recording in a single line is replaced by a group of six smaller variable-area tracks, each a duplicate of the other and 1/6th the width normally employed. The multiple track thus contains 12 simultaneously modulated, identical areas (see accompanying illustration).

More uniform reproduction from the point of view of clarity and naturalness is claimed for this method because much of the waveform distortion that occurs with the usual track is eliminated.

The scanning light beams of most 16-mm projectors depart from perfection in two ways: (1) they are not uniformly illuminated from one side of the sound track to the other, and (2) they are not correctly adjusted for "azimuth" (that is, for the ideal positioning at an exact right angle to the direction of film travel).

Numerous studies have revealed that well-known makes of 16-mm projectors introduced from 15 to 30% intermodulation distortion

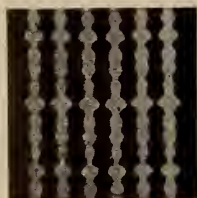
because of the lack of accurate adjustment of the two factors mentioned. 8 to 10% intermodulation distortion is generally considered the maximum permissible in the 35-mm industry.

With a group of six identical VA tracks in place of one, a variation even as great as 50% in the illumination in the projector sound scanning beam will still provide substantially undistorted wave form, the variation over any individual modulated area being extremely small. Since the total signal reaching the photocell is the sum of the signals given by six individual tracks, each of which has very low distortion, the total reproduced signal has low distortion. Similarly, the harmonic distortion of wave-form due to azimuth error is reduced. Overall intermodulation distortion is brought down to values of the order of 5%.

### Early Multiple-Track Patents

Although the multiple track is new to the U. S. A. for commercial recording use, the basic idea is not original. As far back as October, 1918, a German patent was issued to E. M. C. Tigerstedt for a sound recording optical system that produced a multiple track. In the U. S. A. patents were issued to S.O.F.A. Berglund in 1926 and 1927 covering methods of producing such tracks and others have, at various times, been experimentally active.

The multiple sound track will be made available as conversion to all present owners of late-type Maurer recorders, and soon it will be standard equipment on all new Maurer recorders. Further details from Maurer at 37-01 31st St., Long Island City, N. Y.



The Maurer multiple 16-mm soundtrack, which is asserted to give greater clarity and naturalness to reproduced sound.

Change dim screen

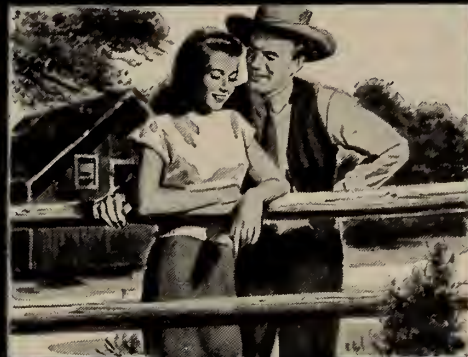
*SQUINT*

**TO**

bright screen

*SPARKLE*

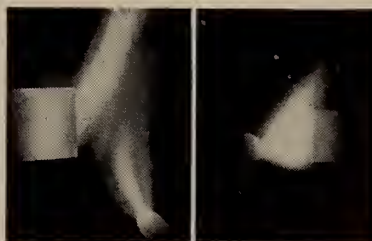
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we'll go  
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# The 35-mm Projection Positive Film

By ROBERT A. MITCHELL

*The first of a series of articles relating to the anatomy, characteristics, and care of various film stocks as used in both studios and theatres.*

## 1. Types of Film

**M**OTION picture film differs basically from ordinary snapshot film only in its physical dimensions and requisite marginal perforations. Each is a *photographic film* consisting of a plastic base coated with sensitized *emulsion*. The light-sensitive coatings of both ciné and still film are essentially the same: one type of plastic base may be used for both kinds of film; and each is exposed, developed, and "printed out" on other sensitized photographic materials by processes which, as far as fundamental principles go, are analogous with each other.

The picture which is brought out by developing a correctly exposed camera film (ciné or still) has a characteristically unnatural appearance. All values of light and shade are reversed: the dark objects in the original scene come out light on the film, and the highlights come out dark. The tonal values of the camera-film picture are therefore *negative* in relation to the tonal values of the original scene.

Negative pictures are obviously ill-suited for exhibition purposes, either in snapshot albums or on motion picture screens. So, in order to get faithful representations of the original scene (images in which the highlights and shadows correspond with those of the photographed scene) the negatives are *printed* on other photo-sensitized materials which are subsequently developed in about the same way that the original negatives were developed.

### The 'Reversal' Process

With the preparation of the *print*, two "reversals" have taken place. The tonal values of the printed-out picture are negative to those of the camera-film picture, but *positive* to those of the original scene. The "positive" made by printing the "negative" accordingly provides a reasonable facsimile of the scene viewed by the camera's eye.

A snapshot negative is ordinarily printed on paper coated with photographic emulsion; but a motion picture negative must be printed on emulsion-coated perforated film.

There is no great difference between negative and positive "raw stock," the term applied to undeveloped motion picture film. In fact, it would be possible to photograph a motion picture on positive stock and print it on negative stock, but the quality of the picture might be

very poor in such a case. There are many different grades of emulsion available, with each having been produced to give the best results when used in the application for which it is specifically intended.

### Types of 35-mm Ciné Film

Because several types of plastics are used for the emulsion-supporting base of film, we sometimes find it convenient to classify motion picture film according to the nature of the base. The two principal categories of ciné-film base are "inflammable" and "safety." A number of specific types are found in each of these two classes:

#### (A) INFLAMMABLE (NITRATE) BASE:

Cellulose pentanitrate (nitrogen content 12.8%); Cellulose tetranitrate (nitrogen content 11.1%); Cellulose trinitrate (nitrogen content 9.1%). [Ordinary nitrate film base is a mixture of these three nitrates, the tetranitrate predominating.]

#### (B) SAFETY ACETATE BASE:

Cellulose diacetate,  
Cellulose acetopropionate,  
Cellulose triacetate,  
Butyryl acetate,  
... and others.

This system of classification is extremely useful to all who process, repair, project, or store motion picture films. Solubility in cementing fluids, flammability, tensile strength, flexibility, resistance to the action of heat, permanence, etc., are among those properties of film which are either wholly or largely determined by the base.<sup>1</sup>

But those who are concerned only with the photographic aspects of motion pictures consider film from an entirely different point of view. The cameraman, for instance, is concerned primarily with the light-recording characteristics of the emulsion, and he can afford to ignore completely many of the properties of film which are of vital interest to the projectionist. The processing technician, however, makes use of both points of view, the physical and the photographic. The film laboratory may therefore be regarded as a bridge directly connecting the complementary fields of cinematography and projection.

Film is classified photographically as "positive" and "negative," a distinction based not on any fundamental differences between the two kinds but rather on the

applications for which they are manufactured. In general, a film made for use in cameras is negative stock, while that intended for use in printers (and, later, projectors) is positive stock. But positive stock is used as a negative in soundtrack recorders and in title cameras, and negative stock is used as a positive after it has been developed by a special reversal process.

Now, both positive and negative stock include many different grades and types of emulsion, permitting further classification:

#### (A) 35-MM POSITIVE STOCK:

Regular positive,  
Sound positive,  
Duplitized positive,  
... and others.

#### (B) 35-MM NEGATIVE STOCK:

Orthochromatic negative,  
Panchromatic negative,  
Extrasensitive panchromatic negative,  
Background negative,  
Infra-red negative,  
Reversal negative,  
Duplitized color negative,  
Monopack color negative,  
... and others.

### Positive Raw Film Stock

On the whole, positive emulsions are "slower" (less sensitive to light) than negative emulsions. Regular Positive, for example, is only about 1/10 as "fast" as Panchromatic Negative. This means that ordinary positive stock requires approximately 10 times the exposure needed by Panchromatic Negative to produce the same *density* of image.

The wide latitude (high contrast-factor) of positive stock compensates for the comparatively low range of contrasts in negative picture images. This characteristic also makes positive raw stock useful as a "negative" for photographing movie titles in which the very highest degree of *contrast* between the white lettering and the black background is desired.

The color response of positive stock does not match the color sensitivity of human vision. Red, orange, and yellow look very bright to the eye, but positive emulsion is so little affected by these colors that when film of this type is used

<sup>1</sup> Parts V and VI of this series are devoted to film-base characteristics and their significance in projection practice.

in a camera, red and orange objects photograph as if they were black. Positive emulsion is only slightly sensitive to yellow and green, but is very sensitive to blue, violet, and the invisible color called ultra-violet.

The structure of positive emulsion is extremely fine-grained, even with ordinary developing. This noteworthy feature permits tremendous magnifications of the tiny film-pictures without appreciable loss of picture detail—an important consideration in the projection of motion pictures on large screens.

The unexcelled fineness of grain and emulsion stability are qualities which make positive stock the ideal negative for sound recording. The special type known as Sound Positive, prepared specifically for this work, is from 2 to 3 times faster than Regular Positive, and is footage-numbered along the edges to help the film-cutter match sound and picture when assembling negatives in the studio.

### Tinted Projection Prints

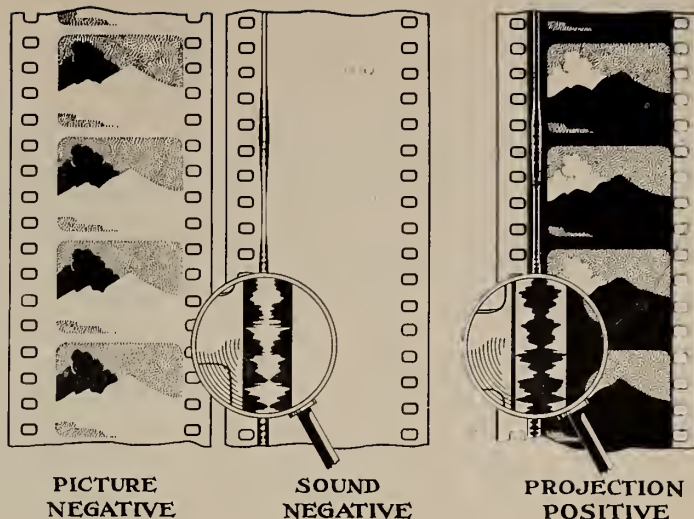
In the days of silent motion pictures from 80% to 90% of the total output of projection prints was made on *tinted-base* positive stock. Each mood and locale in a photoplay suggested an appropriate hue, and the stockroom of the old-time film laboratory accordingly never lacked an assortment of tints sufficiently inclusive to meet any possible exigency of dramatic atmosphere and "artistic" whim. One film manufacturer regularly supplied sixteen colors<sup>2</sup> of tinted-base positive in addition to the regular clear-base stock and a special neutral gray film for low-key effects!

With the advent of sound, the rainbow hues which softened and glamorized the screens of yesteryear departed from the cinema with their gentle sisters, the dialogue "subtitle" and the *sympathos* of the theatre organ. So thoroughly abandoned was the use of tinted stock by producers unwilling to risk the quality of their soundtracks<sup>3</sup> that today only clear-base positive is regularly manufactured.

Duplitzed Positive is a double-coated film used for making two-color "natural" color prints. By means of special printing and processing procedures, one side of the film is printed with the red (or red-orange) component of the picture, and the other side with the complementary blue-green (or blue) component. The superposition of the two colored component images in exact registration results in an approximation, or sugges-

FIGURE 1

Three types of film stocks, showing the transition from negative to positive, with sound track enlarged.



tion, of natural color. (Three colors are required for true natural color.)

Color prints of the Monopack type are true full-color reproductions. The emulsion of a Monopack color film (there are several brand names) consists of three separate emulsions on the same side of the film. When processed, these emulsions provide a combination of the *yellow*, *magenta* and *cyan* components of the original colored scene.

Technicolor prints accomplish the same end (in a more faithful manner) by imbibition printing with yellow, magenta, and cyan dyes.

### Negative Raw Film Stock

Negative stock is available in a wide variety of emulsions. The slowest type, Orthochromatic Negative, is but a trifle faster than Sound Positive, and only about  $\frac{1}{4}$  as fast as the regular Panchromatic Negative. In the matter of color response, Orthochromatic Negative represents only a slight improvement over Regular Positive. It is somewhat sensitive to yellow, but quite insensitive to red. This type of negative film is usually provided with an anti-halation backing of red gelatine to eliminate "flare spots" from excessively bright objects in photographed scenes.

Panchromatic Negative is the most commonly used type of 35-mm negative stock. It is rather fast (about 4 times faster than Orthochromatic Negative and 10 times faster than Regular Positive) and moderately fine-grained. By using special developers, extremely fine-grained images may be obtained with Panchromatic Negative.

All panchromatic emulsions possess color characteristics similar to those of the human eye. They are, therefore, most sensitive to red, orange, and yellow. They are less sensitive to green than to other colors, and are usually coated on the reverse side with green gelatine to reduce halation.

The panchromatic emulsions do not have the great contrast range of positive emulsion, but they faithfully record fine detail in both highlights and shadows.

### Special-Purpose Film Bases

Extra-sensitive Panchromatic Negative, 3 or more times faster than ordinary Panchromatic Negative, is an ideal stock for use under adverse lighting conditions. Newsreel cameramen accordingly find this type of sensitized material an indispensable aid to photography at night, in stormy weather, inside dimly illuminated halls, etc. Nevertheless, the use of Extra sensitive Panchromatic Negative is avoided as much as possible in ordinary work because of its very limited contrast latitude and coarse grain.

Background Negative is an extremely fine-grained, but comparatively slow, panchromatic film made for the photography of "background scenery" which is to be projected on transparent screens in front of which actors perform on studio sets. The excellence of modern "process projection" is due in part to Background Negative.

Infra-red Negative is a film sensitive to invisible infra-red light—the color of longer wave-length than the deepest red that the human eye can perceive. When used in conjunction with the proper filters, Infra-red Negative makes possible moonlight effects of breath-taking beauty—brilliant foliage contrasts, fleecy-white clouds in velvet-black skies, etc. All infra-red emulsions are rather unstable and require careful handling and processing.

### Reversal, Duplitzed Negatives

Reversal Negative (sometimes called Direct Positive) is a panchromatic negative especially adapted to reversing by a special developing process. By "reversing" is meant a reversal of the values of light and shade so that the film exposed

(Continued on page 29)

<sup>2</sup> Red, three hues of pink, three of amber, yellow, two hues of green, three of blue, and three of violet.

<sup>3</sup> Experts have questioned whether tinted stock causes variations in sound volume too great to be tolerated. In any event, the subject of tinted film is too intriguing to be dismissed with these brief remarks. Additional data must, however, be deferred to the last part of this series.

**T**HE North Drive-In Theatre on Route 11 between North Syracuse and Cicero, N. Y., is a noteworthy example of the modern drive-in equipped to meet the highest standards in visual and sound projection. Opened June 18 last, it is owned and operated by McConnel-Read Corp of Syracuse, N. Y., and was designed by Leon Einhorn, architect, Albany, N. Y. In area and design, it is potentially a 1000-car theatre; currently, 700 speakers are in use.

In designing and equipping this theatre, every care was exercised to insure patrons an opportunity to see and hear the performance with the utmost satisfaction. This is no mean accomplishment in the sphere of the drive-in theatre, which, because of its physical nature, not only falls heir to the projection problems of the largest conventional theatres, but tends to aggravate these difficulties as well as having to contend with some peculiar to itself. In the main, these difficulties relate to the great size of the screens, the long "throws," atmospheric liability, and extension of audience dispersal.

### Projection Facilities, Housing

Projection facilities at the North are such as to effectively cope with these difficulties, and make possible a steady, undistorted 54-foot image of such brilliance and definition as to be visible in detail from a distance of half a mile.

The projection department occupies two rooms in the main building in the center of the fifth ramp, 280 feet from the screen. Running the width of the building, the combined length of the rooms is 37 feet. The projection room proper, in feet, is 20 long, 11 wide and 8 high. Its equipment includes: two film projectors, amplifier racks, rewind bench, film cabinet, record player and microphone.

The generator room is 17 x 11 x 8 feet and houses a 360-ampere Century Actodect with a 40 h.p. motor, the arc rheostats, and a rotary positive air compressor, powered by a Wagner 1½ h.p. motor.

The projector components are: Brenkert BX-80 mechanisms with Kollmorgen F:1.9 Super Snaplite lens, Brenkert Supertensity arc lamps, model A-4, and

## Notes on Drive-In Theatres

By C. EDWARD WHITFORD

Member, IA Local 376, Syracuse, N. Y.

Brenkert heavy-duty bases. The sound heads are RCA PG-285's; changeover devices are Essannay Zippers.

Air jets are used to cool the film at the aperture. The air is drawn through a filter outside the building, compressed, and piped under two pounds pressure to a pair of nozzles front and rear of the apertures. This method of cooling has proved successful at the North, with the heat-laden air being rapidly removed before its heat is absorbed by machine parts.

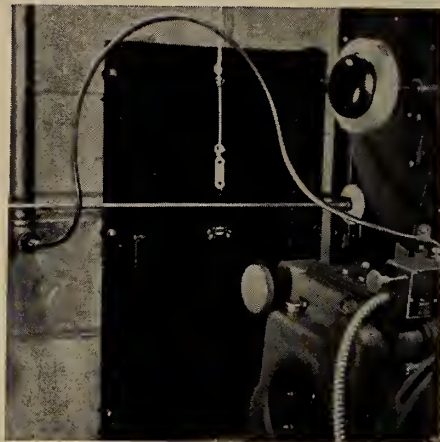
This heat removal is aided by the exhaust fan, integral with the BX-80 projector, and by the arc lamp exhaust system. The latter function is made possible by: (1) the absence of any glass heat filter between lamp and film; (2) the double-walled structure of the lamphouse which creates a suction through the cone; (3) the fact that the lamp may be exhausted at a very high rate without arc turbulence, and (4) the powerful fan exhausting the lamps.

The lamps are so recent in design and production that, at this writing, only eight are in service nationally. At the North, a 13.6-mm National Super H. I. rotating positive is used with a ½-inch, heavy-duty Orotip negative. Line voltage is 105, and the arc draws 170 amperes.

### Arc Lamp, Projector, Sound

Within the lamp, current is conducted to the arc in such a way that no arc stabling magnet is necessary. Correct arc burning is facilitated by adjustment mechanism which provides for vertical tilting of the negative as well as for horizontal positioning. The two-element condenser combination has a speed of F:2.0, with each element being individually mounted and both cooled by air from a blower mounted at the rear of the lamp with the carbon feed mechanism.

The design of the BX-80 mechanism includes a feature which solves a serious problem peculiar to drive-in operation—the presence of airborne dust, fumes, and



The non-operating, or gear, side of the projector, and the path of the compressed airline from the front wall to the projector. Another air nozzle is hooked-up to the film side of the mechanism.

From the wall the airline is reduced to ¼-inch copper tubing. The hump shown in the tube, as it curves upward and down to the projector, serves two purposes: (1) it provides flexibility of the tubing to absorb vibration and to permit any possible change in projector tilt, and (2) permits the projectionist to have unobstructed access to side of projector at the front.

moisture. This hazard is minimized by the mechanism's oiling system which employs a circulating oil bath in a sealed gear compartment.

The sound system is an RCA PG-285 having two main amplifiers of 250 watts audio output each. In regular service, each amplifier serves 350 of the 700 in-car speakers. In emergency, either one can assume the full load, indefinitely. In the projection room, two in-car speakers, each monitoring its own amplifier, provide a constant check on individual amplifier performance.

Last, but by no means least, in contributing to patron satisfaction is the forward tilt of the screen. This serves to minimize keystone distortion, and to reflect the picture at the audience, which, after all, does pay to see it.

THE VITAL ELEMENTS THAT MAKE POSSIBLE A DRIVE-IN THEATRE: SCREEN, PROJECTION ROOM, AND PROJECTOR

Massive screen mounting

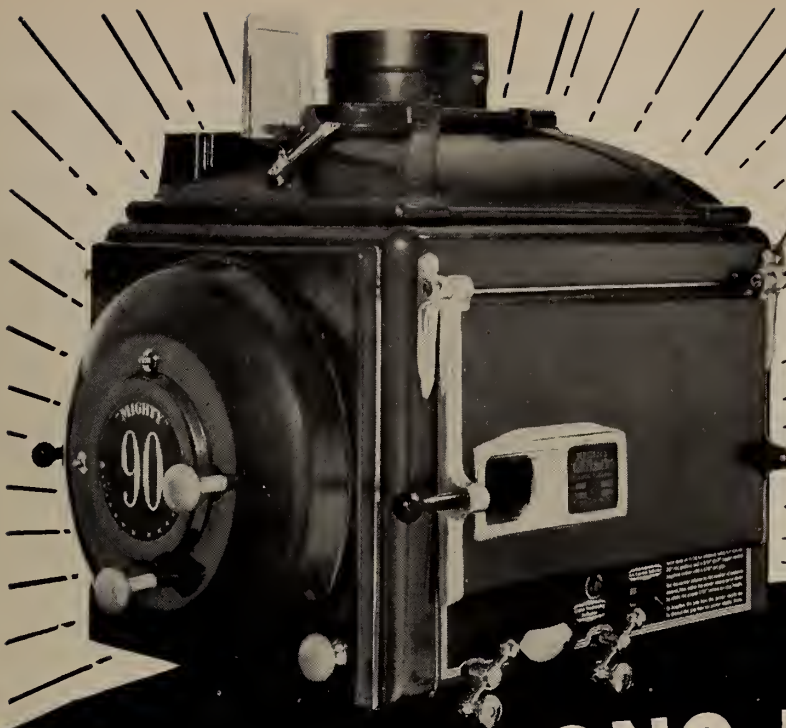


Projection room housing



Projection room installation





**HERE'S EVEN  
MORE LIGHT  
THAN  
YOU'LL NEED!**

*The Sensational NEW* **STRONG MIGHTY "90"**  
75 to 130 Ampere  
**REFLECTOR ARC LAMP**  
with **EXCLUSIVE LIGHTRONIC CONTROL**

★ PROJECTS 21,000 LUMENS [at 90 amperes]—26,000 LUMENS [at 130 amperes] as compared to 17,000 lumens for the 70 ampere Suprex or 7,000 lumens for the 1 K.W.

★ THERE'S NO SCREEN TOO BIG FOR THE STRONG MIGHTY "90"!

★ IMPRESSIVELY MASSIVE LAMPHOUSE

combines with

★ FORCED AIR COOLING

of the carbon feed mechanism to insure low operating temperatures

★ RUGGED BURNER MECHANISM

★ EXCLUSIVE LIGHTRONIC

**AUTOMATIC CONTROL SYSTEM**

Maintains the position of the positive arc crater at the exact focal point of the reflector. The positive and negative carbons are advanced so as to maintain proper arc gap length by separate motors, the speeds of which are governed by the Bi-Metal Lightronic Tube. Once the arc is struck no manual adjustment or further attention is required.

★ BIG 16-1/2 INCH REFLECTOR

matches high speed *f* .9 lens.

★ COMPLETE COMBUSTION OF BLACK SOOT

is assured by a stream of air directed just above the arc and which stabilizes its burning and carries away the white smoke which would otherwise be deposited on the reflector.

★ UNIT CONSTRUCTION

Various components instantly removable for cleaning and inspection.

★ MANY ADVANTAGES AVAILABLE IN NO OTHER LAMP

★ BACKED BY THE FAMOUS STRONG GUARANTEE

Build your business with more brilliant pictures. See an actual demonstration in your own theatre or drive-in now and you'll be convinced that here is

**THE FINAL WORD IN HIGH POWERED PROJECTION ARCS!**

Use coupon now to arrange free demonstration. No obligation.

**THE STRONG ELECTRIC CORPORATION**

31 City Park Avenue

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☐ I would like a demonstration of the Strong Mighty "90" in my theatre, without cost or obligation.

Please send free literature on the ☐ Mighty "90"; ☐ Mogul Lamp; ☐ Utility Lamp; ☐ Strong Arc Spotlamps; ☐ Strong Rectifiers; ☐ Strong Reflectors.

Name.....

Theatre.....

Street.....

City & State.....

**T**HERE are strong signs that the motion picture industry, in facing the problems created by the spectacular boom in home television (Tv) and its impact on motion picture theatre attendance, intends to "fight Tv with Tv." The creation of what amounts to a new medium of mass entertainment and communication involves numerous technical, economic, and legal problems, and calls for broad vision, clarity of thinking, and inspired leadership.

Theatre Tv involves the exhibition of visual and aural television programs on large screens (about 15 x 20 feet). These programs are photographed outside the theatre by regular Tv cameras, transmitted to the exhibiting theatre over microwave radio relays, coaxial cables, or telephone wires, and received in the exhibiting theatre.<sup>1</sup>

In the United States, two systems of theatre Tv equipment have been developed for the purpose of projecting the program to the screen: the *direct-projection* and the *intermediate-film* systems.

Tv broadcast stations licensed by the FCC are intended to transmit programs to the public generally, primarily for reception in the home. Theatre Tv does not come within this definition because its programs are beamed directly by means of closed-circuit coaxial cables or wires, or by directional microwave relays, to the exhibiting theatre, and they are not intended to be received by the general public.

### **Theatre Tv Development**

Large-screen projection Tv is nearly as old as the direct-view Tv that predominates in home reception. In 1930, Tv on a 6 x 8-foot screen was shown by RCA at RKO-Proctor's 58th Street Theatre, New York. Large-screen theatre Tv on a 15 x 18-foot screen was exhibited in London, England, in 1939, and by the end of that year five theatres were so equipped. In 1941, a Madison Square Garden prize fight and a Brooklyn Dodgers baseball game were demonstrated to the public by RCA on a 15 x 20-foot screen in the New Yorker Theatre. The onset of war interrupted the further development of theatre Tv in both England and the United States.

During the general frequency alloca-

(1) Other uses of Tv by the motion picture industry might include (1) ownership of Tv broadcast stations, and (2) development of pay-as-you-see plans such as Zenith Radio Corp.'s "Phonevision."

\* Reprinted from Vol. IV, No. 2, of The Hollywood Quarterly with its kind permission.

† NOTE: The opinions and conclusions stated are the personal views of the authors.

John Evans McCoy is Chief, Television Branch, Law Bureau, Federal Communications Commission; Harry P. Warner is author of "Radio and Television Law," contributor to law journals and other periodicals on communications law, and is associated with Segal, Smith, and Hennessey.

FIRST OF A SERIES OF ARTICLES WHICH BY REASON OF THEIR INCLUSIVENESS CONSTITUTE A 'MUST' FOR A THOROUGH UNDERSTANDING OF THEATRE TV IN TERMS OF EQUIPMENT USED, RADIO-FREQUENCY REQUIREMENTS, METHODS OF PROGRAM DISTRIBUTION, CAPITAL COSTS OF A NATION-WIDE SYSTEM, AND SOME ASPECTS OF PROGRAMMING IN MOTION PICTURE THEATRES.

# **Theatre Television: What, How and When\***

By JOHN EVANS MCCOY†

and HARRY P. WARNER†

tion hearings held before the FCC in 1944 and 1945, Paul J. Larsen, on behalf of the Society of Motion Picture Engineers, appeared and requested the allocation of frequencies to theatre Tv.

After the war, Paramount Pictures directed its research to the development of the intermediate-film method of theatre Tv which culminated on April 14, 1948, in the surprise public exhibition of a 15-minute televised newsreel at the Paramount Theatre, New York. The images were transmitted via a 7000-megacycle microwave relay from the Navy YMCA, Brooklyn, to the top of the *Daily News* Building on East 42 Street, thence to the Paramount Building at Broadway and 43 Street, and from there down a coaxial cable to the receiving and film-making equipment.

### **RCA-Fox-Warner Theatre Tv**

The pictures were filmed on regular 35-mm stock, and, because of the new rapid film-developing process, reached the 18 x 24-foot screen 66 seconds after the scenes were shot. On June 25, 1948, the same process was employed at the Paramount Theatre in a showing of the Louis-Walcott prize fight, and since that

date similar exhibitions have been given frequently.

Meanwhile, RCA, collaborating with 20th Century-Fox and Warner Brothers, proceeded with the development of the direct-projection system of theatre Tv. In July, 1947, 20th Century-Fox and Warner Brothers signed joint research agreements with RCA for common participation in the development of this system.

The three organizations sponsored a private showing of theatre Tv (15 x 20-foot) at Warner's Burbank Studio in May, 1948; and on June 25, 1948, history was made by the public showing in the Fox-Philadelphia Theatre of *instantaneous* Tv pictures of the Louis-Walcott prize fight, using an intercity relay from New York to Philadelphia. The program was picked up at the Yankee Stadium, New York, and relayed by microwave relays successively to WNBT (Empire State Building, New York), WPTZ, Wyndmoor, Penna., and the Fox-Philadelphia Theatre, a distance of about 100 miles. From the roof of the theatre the program was run to the receiving and projecting equipment by coaxial cable. The reaction of the audience in the 2400-seat theatre was described as highly enthusiastic.

### **Theatre Equipment Required**

On April 4, 1949, the RCA-Fox-Warner system was demonstrated before the SMPE at the Statler Hotel, New York, the programs being relayed in part via balanced telephone wires from the Em-



## He makes the most of moonlit moments . . .

IT'S mighty important to star . . . director . . . movie-goer . . . to have this moonlit moment come alive upon the screen.

And when it does—in all its subtlety of mood in light and shadow—the credit's due in no small measure to the important contribution of the laboratory control engineer.

For his knowledge of photochemistry, his "eye" for photographic quality . . .

his vigilant control of printing density and contrast . . . do much to make moonlight footage *look* like moonlight, and help to bring out the best in every frame of film.

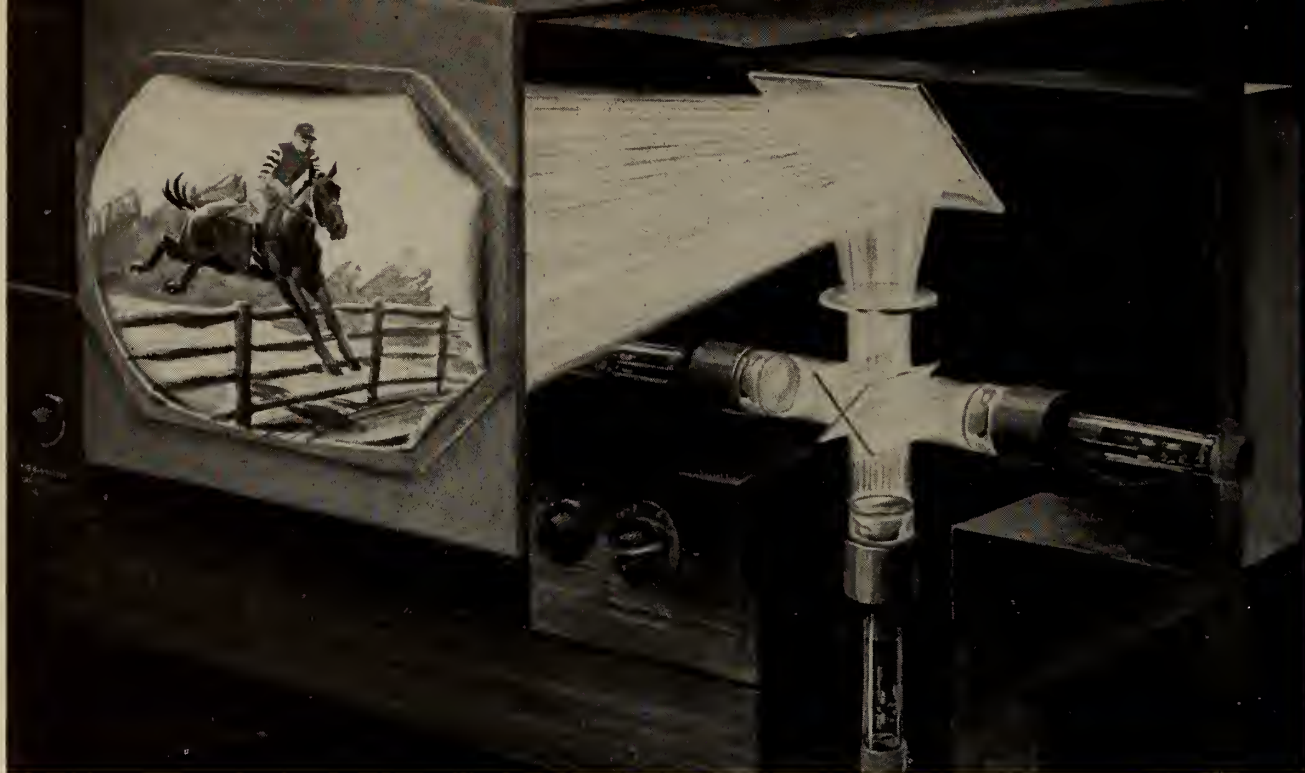
Quality of film contributes, too; and this important assistance the laboratory control engineer is sure of when he works with the famous Eastman family of motion-picture films.

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## RCA Color Converter Using Small Projection Kinescopes and Refractive Optics

DIRECT-VIEW picture reproducing system developed by RCA for color Tv uses three kinescopes and two dichroic mirrors. In operation, the red components of the scene appear on the lower tube and are reflected to the viewer by the right hand mirror. Blue components are formed on the middle tube and

are reflected by the left hand mirror through the right mirror to the viewer. The green components created on the left upper tube pass straight through the two mirrors to join the other two color versions of the scene to give the viewer the effect of the combination of the three colors.

pire State Building to the hotel. The RCA-Fox-Warner group has also developed intermediate-film equipment.

The equipment required for theatre Tv falls into two general categories: that which is installed *in the theatre* for receiving the program and projecting it to the screen, and the equipment used *outside* the theatre for pickup of programs and relay to the theatre.

The first problem undertaken was the development of theatre Tv equipment. These units have now reached the point where two systems are now ready for commercial use: the *direct* (or instantaneous-projection system) and the *intermediate-film* (or film-storage) system.<sup>2</sup>

The direct-projection system, developed by the RCA-Fox-Warner group, consists of (1) the receiver-projector, which includes a projection cathode-ray tube as the source of the light image, and the optical system which projects the image to the screen by a reflective process; (2) a viewing screen; (3) a

(2) Electronic-storage, as opposed to film-storage, methods are also under development, using the Skiatron tube (or P10 phosphor) and the so-called Swiss or AFIF Method, developed by Dr. F. Fischer of the Swiss Federal Institute of Technology. Electronic-storage methods, however, are not expected to be available for commercial use in the near future.

Tv control console; and (4) a power-supply rack and high-voltage power unit.<sup>3</sup> If the Tv program is brought to the theatre by a microwave relay system, the theatre installation will also include a receiving antenna, receiver, and a transmission line to carry the program from the antenna to the receiver.

### Data on RCA's Latest Equipment

RCA's latest projector utilizes a 12-inch cathode-ray picture tube inclosed in a barrel about the size and appearance of a Bendix home washing machine. The optical system enclosed in the same barrel employs a 21-inch spherical mirror and a correcting lens, employing the Schmidt-type optical system.

As installed, the picture tube faces the rear of the theater and projects the picture on the spherical mirror which reflects it toward the screen. The picture passes through the correcting lens on its way to the screen. The picture tube operates with 80,000 volts, as compared with the 9000 volts used in most home Tv receivers. The optical system is capable of projecting a screen image 18 x

(3) A similar direct projection system has been developed in England. See A. G. D. West, "Development of Theatre Television in England," *J. Soc. Mot. Pict. Eng.*, vol. 51, pp. 127-169; August, 1948.

24 feet, which is larger than the average motion picture screen.

The entire projector unit weighs about 180 pounds and is designed for installation either suspended from the balcony or mounted on a platform in front of the theater mezzanine, rather than in the regular projection room. The "throw distance" can be varied from 45 to 80 feet.

RCA plans to manufacture pilot models before the end of 1949 for sale to theatres at a price under \$25,000. The first such unit has been ordered for installation in the Fabian Fox Theatre in Brooklyn, New York. The installation of microwave receiving equipment and a transmission line would cost approximately \$3500 at present prices.

### Intermediate-Film System

The viewing screen is an important element of the direct-projection system. The cathode-ray tube, which is the light source for projection Tv, at this stage of development cannot compete with the carbon arc which is the light source in conventional motion picture projectors. Thus, while standard motion picture screens are generally not directional in distributing the light, much research has been devoted to the development of directional screens for Tv.

The Paramount intermediate-film system consists of (1) receiving equipment, (2) a specially developed recording

camera, (3) rapid film-processing equipment, capable of developing film in less than a minute, and (4) a conventional 35-mm motion picture projector. If the program is received over microwave relay, receiving equipment and a transmission line must be installed.

The receiving equipment is contained in one unit, which houses both video and audio equipment, and high- and low-voltage power supplies.

The receiver utilizes a 10-inch cathode-ray tube, aluminum-backed and with a flat-face screen, from which the picture is photographed. A 15-inch cathode-ray tube is provided for monitoring purposes. The special recording camera utilizes an electronic shutter, rather than a mechanical one, and is synchronized at the standard film rate of 24 frames per second. Twenty frames before exposure of the picture the sound track is impressed on the film.

### High-Speed Film Processing

One of the amazing features of this system is the high-speed film-processing unit, into which the film passes by chute from the recording camera. The film is lead by vertical chutes into solutions which develop, fix, and wash it, and into a compartment which dries it in a maximum period of 66 seconds. The processed film either may be wound on reels or fed directly to the conventional 35-mm film projector by chute. The equipment requires a room of about 10 by 20 feet floor space, which is usually located directly above the projection room.

It has been reliably, and probably conservatively, stated that the cost of the receiver, camera, and processing unit will be approximately \$35,000, plus installation. Units of this type have been installed in Paramount theatres in New York, Chicago, and Los Angeles. It is likely that the price of the three units may be in the \$15,000 to \$20,000 range, plus installation, when available in commercial quantities. The microwave receiving equipment and transmission line would add an additional \$3500.

Theatre Tv equipment has not yet attained the perfection of class A motion pictures, although engineering opinion supports the conclusion that such per-

(4) The 20th Century-Fox report to the FCC of its experimental theatre Tv operations contained the tentative conclusion: "The quality of a television picture having a total of 525 scanning lines per frame and a horizontal resolution in excess of 600 lines, with good picture contrast ratio, will approach that of 35-mm professional motion picture film, provided there is good halftone reproduction, accurate line interlace, and specified minimum of geometric distortion. Such a value of horizontal resolution would require a video band-pass of between 7 and 8 megacycles."

fection is attainable. However, 20th Century-Fox recently advised the FCC that in its opinion "the generation of a theatre Tv picture of suitable quality is not only possible but practical."<sup>4</sup>

The final arbiter of picture quality is the audience, and theatre Tv has been received favorably by the public. There is some danger that in waiting for technical perfection, the motion picture industry may lose the opportunity to secure the radio frequencies and other transmission facilities that would make theatre Tv possible.

### Distributing Theatre Tv Programs

The most critical and urgent problems facing the proponents of theatre Tv involve determination of methods and means for transmitting programs to the theatres. It is well known that Tv pro-

grams may be transmitted by radio relays, by coaxial cable, and by telephone wires for short distances. The opportunity to use these avenues of program distribution cannot be had merely for the asking. The use of radio relays requires approval by the FCC. The use of coaxial cable and telephone wires requires the co-operation of A.T.&T. and the Bell System.

Wherever theatre Tv applies for transmission facilities it must prove a demand for the facilities and it must overcome strong competition for the same facilities by broadcast Tv networks and stations, and by other users of the same facilities.

Theatre Tv may be carried out as an independent enterprise by one theatre which provides or obtains all of its own

(Continued on page 32)

## Early Photographic Collection Recalls Governor's Bet

**A**N HISTORIC photographic collection is a reminder of a governor's wager that a galloping horse lifts all four feet off the ground at once. The collection is part of the equipment used by Eadweard Muybridge, a photographer of the 1870's, which will be shown at George Eastman House, the photographic museum in Rochester, N. Y., which was opened to the public this fall.

The collection was made available through the generosity of Dr. George Nitzsche, recorder emeritus of the University of Pennsylvania.

Governor Leland Stanford of California made the bet; Muybridge tackled the tough photographic job. After many trials, the latter lined up a number of cameras along a track. Eventually he attached strings to electric switches that controlled the camera shutters. When a horse galloped past, it broke the strings one after another. The shutters were released and negatives made in a series. The photographs proved that Governor Stanford was right. The feet were off the ground during the gallop.

### Filled Still-Motion Picture Gap

Muybridge was a pioneer in instantaneous photography. His work fills the gap between still and motion picture history. While he set out to eliminate motion by stopping it in pictures, in 1880

he also projected photos intermittently. This produced motion on the screen. Thus he anticipated the motion picture.

His projected pictures of horses in motion amazed audiences. *The San Francisco Call* of May 5, 1880, reported that "nothing was wanting but the clatter of the hoofs upon the turf and an occasional breath of steam from the nostrils, to make the spectator believe that he had before him genuine flesh-and-blood steeds."

Later Muybridge went to Philadelphia where he continued his work at the University of Pennsylvania from 1883 to 1885. Here he perfected his equipment. He also turned to use of the new dry plates for shorter exposures. The results of his work were published in a series of 781 illustrations on animal locomotion. For his pictures he used horses and animals of all kinds from the Philadelphia zoo as well as human models.

Muybridge's photography at Philadelphia was done outdoors against a black background. Opposite the background he had a battery of 24 cameras. A camera in the collection at Eastman House is one of these. Also in the collection are Muybridge's notebooks, 13 albums containing a large number of his duplicate negatives, and an album of albumen prints which are considered to be the best of his work.

The clincher. Muybridge photographs like these proved that a horse lifts all feet off the ground at once in a gallop, winning a bet for Governor Stanford of California in 1870.



**B**EARING on the two excerpts from BIP shown within rules at right, both Eastman Kodak Co., and Robert A. Mitchell—no less than the projectionist craft generally—should find the appended comment and accompanying photographs of more than passing interest.

First, however, the writer expresses his sincere thanks to Max Scharnberg, Ciné Engineer and Instructor, Teknologisk Institut, Copenhagen, Denmark, for the two highly interesting photographs here reproduced.

### Water for Film Fires

Figure 1 destroys many cherished illusions about the ability of water to put out film fires. Burning film can sometimes be extinguished by liberally dousing it with water—but not always. If the reel is burning vigorously, it may continue to burn even if it be dropped into a tub of water, as this amazing photograph shows.

This spectacular demonstration was performed at the Institute of Technology in Copenhagen for the benefit of projectionist license applicants.

Take a good look at Fig. 2 and imagine a fire like that in *your* projection room! In the event of such an accident, the projectionist should never attempt to fight the fire, but:

1. Switch on the house lights.
2. Drop the port shutters.
3. "Kill" the arc.
4. Get out of the projection room.

The projector magazine in this picture is fitted with the "Dawesnets," familiar to projectionists who operate the Ernemann, Bauer, and Euro projectors, the Aga (Swedish) the Philips (Dutch),

FIG. 1. Nitrate film burning under water.



"Safety film avoids the principal hazard of nitrate film. Nitrate film burns very rapidly indeed. When a roll is thoroughly ignited, it cannot be extinguished with a fire extinguisher nor even by immersion in a bucket of water. This is because it carries its own oxygen supply within itself in the form of the nitrate group."

*Excerpt from "Questions and Answers on Safety Film"; IP, Sept., 1949, p. 14.*

"Regardless of what Eastman Kodak Co. says about film burning under water (see foregoing excerpt), most celluloid factories rely on nothing but water to combat fires

which may occur. I once set afire outdoors a full 2000-foot reel of film, and put it out by simply throwing a bucket of water on it. I should like to try dropping a blazing reel into a tub of water, but I have only a few reels of my own left. . . .

"Water, to be effective, must be applied in a powerful continuous stream. Sprinkling systems are of no value because they do not apply sufficient water to cool the film below the ignition temperature."

*Excerpt from "Fire Extinguishers in Projection Rooms," by Robert A. Mitchell; IP for Oct., 1949, pp. 12, 30.*

## Film Fire Characteristics

Will film burn when totally submerged in water?

**It certainly will!**

By RICHARD D. MARKS

and the Mikroteknika (Italian), mechanisms.

The Dawesnet, required by German regulations, consists of an opening on each side of the magazine, each of a size 6 per cent of the area of one side, and covered over with a wire screen (like mosquito netting) having 144 meshes per square centimeter. This construction explains why the flames are issuing from both sides of the magazine shown in the picture.

### Minimum Factor of Safety

In regard to the Dawesnet as a "safety" device, a top-flight European motion picture technician states:

The intention is that the film in the magazine is to have a supply of air in order that it burn with a bright flame, thereby avoiding the accumulation of explosive gas in the projection room. The net, furthermore, ought to prevent the flames from issuing from the magazines; but, unfortunately, there arises so great a pressure that flames up to 2 meters (6 feet) jump out through the net and set fire to the film in the other projector and raze the whole projection room."

It is easy to see why the wire screen of the Dawesnet fails to confine the fire. A reel of film, when burning, may attain a temperature which produces enormous volumes of such combustible gases as carbon monoxide, hydrogen, and methane.

Now, it is possible to conjecture with some accuracy that the wire Dawesnet attain bright-red heat (of the order of 800° C.) in about 15 seconds from the time of outbreak of fire in a magazine,

and, further, that the net becomes even hotter than this before the fire has subsided. But even red heat is a sufficiently high temperature to ignite the combustible gases. Carbon monoxide ignites at 645° C. in air under standard barometric pressure; hydrogen at 585° C.; and methane at 650° C.

Projector magazines of American design are totally enclosed and are so constructed that the doors unlatch and fly open when the gases from burning film attain a certain degree of pressure. Serious explosions may result when the doors fail to open\* (see footnote at end of article).

Several correspondents in foreign countries have expressed doubts that American magazines are entirely safe, and they have asked the writer if the doors are made to open at a definite gas pressure. Of course, projector magazines are not absolutely air-tight, but it does seem only fair to offer these cor-  
(Continued Col. 1, foot of next page)

FIG. 2. Film fire in a projector magazine.





To the Editor of IP:

On several occasions I have noted in IP that American projectionists cite certain long-run prints, some of which are said to be run 300 or 400 times. I wish you would carefully examine the enclosed clips from



Clip of Charlie Chaplin print which, 32 years old, was recently projected 150 times within one week.

two "original" Charlie Chaplin films—"The Immigrant" and "1 A.M." These prints—now 32 years old!—were run a total of 150 times in two different theatres here recently. During the entire run I had no stops or trouble of any kind.

Notice how pliable and soft these clips still are, and also the complete absence of scratching, embossing or any other defect.

PERCY T. MOLLER  
Melbourne, Australia

To the Editor of IP:

I am somewhat troubled by the tone of your Monthly Chat in IP for October (p. 3).

respondents some assurance that the magazine doors *will* open if film burns in the magazines—particularly in view of the fact that the use of American equipment may be vetoed unless they are convinced on this point.

We want American equipment to be used in every country, not because it is *American*, but because it is the *best* equipment in the world. Projector manufacturers and exporters of equipment are invited to contribute their opinions on magazine construction to IP for the benefit of skeptical projection engineers and safety officials overseas.

\* NOTE: This statement will occasion many an arched eyebrow, and it has already induced strong disagreement from two projector manufacturers, who point out that it would take one whale of a lot of pressure, even exceeding that produced by a burning full double reel, to accomplish such a result. We'll let the statement stand as written, however, in the hope that some reader will have something interesting to say anent this topic.—Ed.

Have you found it impossible to arrange with the equipment manufacturers that panel discussion for which you originally seemed to have such high hopes. I hope not; but the phrase "abortive effort" in your Chat leads me to believe that, for some reason or other, you have given up on the project.

It does seem strange that the manufacturers, with every means for research and test at their disposal, should come forth with mere statements of opinion instead of indisputable facts. Anybody can express an *opinion*, even a person who has no clear understanding of the matter under consideration. I should like to see IP prosecute this panel session matter vigorously, so that we could come up with the correct answer.

RICHARD VAUGHAN  
San Francisco, Calif.

IP's offer to handle all details of organizing such a panel session—providing quarters, making a transcript of the proceedings, in fact, all necessary arrangements—still stands. IP can only invite, only propose; the real initiative must come from the manufacturers themselves.—Ed.

To the Editor of IP:

I was very much interested in the article "An Improved Concentrated-Arc Light," which appeared on page 10 of your October issue, but I am not quite sure just how this lamp operates—that is, how it is started, and what happens once it is operating.

ROY McALLISTER  
Los Angeles, Calif.

Western Union's new open-air Telco-arc lamp emits light at a brilliance of 130 candles per sq. mm from a thin surface of *molten* zirconium metal (1 in the accompanying illustration) at the end of specially prepared electrodes (2). The electrodes are made of nickel, filled to a depth of  $\frac{3}{8}$  inch with a mixture of 87 per cent zirconium oxide, 8.7 per cent nickel, and 4.3 per cent other materials.

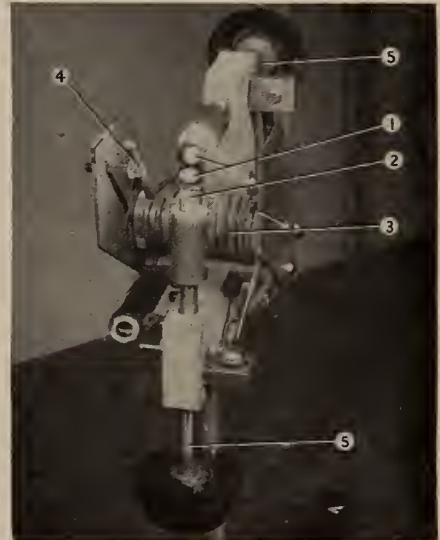
These tiny electrodes are warranted by W. U. to operate continuously for 37 hours.

The lamp is started by bringing together the two electrodes so that the zirconium oxide caps are touching (similar to a carbon "freeze") and then the power is turned on. Once the arc is "struck," a high-voltage pulse is provided from an inductor and vacuum switch, or a high-voltage transformer, to form the *active* zirconium surface which is the light source of the lamp. After the active surface is formed, the lamp

will operate at its normal rating of 55 volts.

Stability of the arc is provided through the use of a differentially-coiled electromagnet which exerts control in direct proportion to the lamp current in a vertical direction, and by a permanent magnet in the horizontal, or lateral, direction.

Arc-spacing is controlled by micrometer screws (5) which require adjustment only once every half-hour during operation—similar to the carbon-arc gap with which projectionists are familiar. It is also possible to provide automatic arc-spacing control through an electrical control mechanism.



The W.U. concentrated-arc: 1, Zirconium metal surface (active luminous area); 2, Specially prepared electrodes; 3, Differentially coiled electromagnet with wide pole pieces for vertical arc stream control; 4, Permanent magnet for lateral arc stream control; 5, Micrometer screw control for adjustment of electrodes.

### Altec Service Personnel Increased

An increase in Altec Service contracts to an all-time high in company history has resulted in promotions and additions to the staff of men who are well-known in projection circles. Ralph Kautzky has been advanced from Broadway (New York City) service inspector to New York suburban field manager, taking in New Jersey and upstate New York. J. I. Mather, formerly field manager in Detroit, becomes field manager in the Washington, Maryland, and Virginia areas, with a special assignment under the new Altec contract with the U. S. Navy.

Also under the Navy contract, R. W. Fuller, formerly with the Electronic Division, has been added to the Boston staff; L. G. Schock, formerly with Warners in Atlantic City, goes to Providence, R. I.; W. J. Sirms, another former Warner man in Philadelphia has joined Altec in that area; N. Markanich, temporarily in Newport News, formerly of Scranton; Ernest Theiss in Washington, and Adolph H. Baus, Jr., formerly with Sperry Gyroscope, to Brooklyn.

Fred Pheiff, formerly New York suburban field manager, has been promoted to duty in Altec's New York City headquarters.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

*Your attention is directed to the article on Page 5 of this issue*

**W**ITHOUT detracting one bit from the swell job done by President Philip Murray and his CIO aides in effecting a settlement with the steel companies, which gives steel workers vastly increased social benefits, there is one point on which we think the CIO leader is in error. Mr. Murray was quoted as saying that the settlement was the "most outstanding achievement of its kind attained by any union through *voluntary* collective bargaining in this or any other country."

When Mr. Murray uses the phrase "voluntary collective bargaining," he means that the deal was made by *direct* negotiation between union and employer, without government intervention of any kind.

Now, we have a union right in our own IA which more than a year ago (Sept. 1, 1948) achieved through *voluntary* collective bargaining, and *without a strike*, a welfare set-up which, while not matching in scope the 70,000 steel workers' settlement, certainly was a pioneering achievement—the more difficult be-

cause it affected a field which properly may be considered as being more on the "service" rather than on the straight "industrial" side, such as steel production. We refer to the Chicago Local 110 general welfare plan, which also includes pensions.

In passing, it might be remarked that the steel workers' pensions will be reduced by whatever payments they receive under the Federal Social Security Law, which restriction definitely does not apply to the Local 110 arrangement. Incidentally, the figures for the first full year of operation of the Local 110 plan have now become available and are presented here:

Receipts .....	\$397,671.84
Disbursements .....	217,819.79
Cash on Hand .....	\$179,852.05

We understand that President Walsh is now negotiating for the establishment of a general welfare plan, including a pension arrangement, for the motion picture studio workers. More later on this.

- Lester Isaac, director of projection and sound for Loew's, Inc., has been shuttling back and forth between N. Y. City and the West Coast, supervising the projection installations for the newly-remodeled State Theatre, Los Angeles, and the Warfield Theatre, San Francisco. These houses are now under the management of Loew's Theatres, Inc., and will be supervised as integral units of the national set-up.

- Fresno, Calif. Local 599 recently honored four of its members with life-membership cards for outstanding services rendered the Local. Recipients of the awards were Grover Miller, member of Local 599 since 1915 and business representative for 15 years prior to his retirement last year; Frank Bell, who served as financial secretary for 20 years; Harry Wolfe, member since 1917, and Homer Elias, who has been a member of the Local since 1919. Both Wolfe and Elias served in various official capacities.

- Ground was broken last month for Los Angeles Local 150's new home. The early-morning ceremonies, conducted by Frank Sawyer, the oldest card-holding member of the Local, attracted a fine turnout. The usual roundup of "sidewalk superintendents" are now gathered daily at 1800 S. Vermont Avenue, the future address for Local 150 headquarters.

- Most of us are familiar with the double-talking politician who, while running for public office, makes a bid for the labor vote by professing his staunch support of organized labor. Labor is wise to these wily individuals and is pretty careful to check a candidate's record of past performances before lending him support.

All this leads to the case of Louis A. Johnson, our Secretary of National Defense (who is rumored to be a 1952 presidential candidate), *vs.* IA Local 270, Clarksburg, W. Va. We understand that Mr. Johnson is an important stockholder in the Clarksburg Theatre Corporation and directs its policies. Although the officials of Local 270 have tried repeatedly

## 25TH ANNIVERSARY PARTY OF LONG ISLAND (N. Y.) LODGE 67, TMA



Seated (l. to r.): Mrs. Mobel Lloyd, Mother of all TMA auxiliaries; Phil Hitter and Mrs. Hitter; Mrs. Weidner, Mrs. Nodel, Mrs. Adelson, Mrs. Pantizis, Mrs. Underhill, and Mr. Adelson. Center row (standing): Charles Eichhorn, T. J. Lloyd, L. Burns, J. Weidner, A. Silvermon, N. Nodel, H. Felsing, S. Fink, and J. Borish. Back row: Charles Muller and W. W. Friedman.

during the past years to organize the corporation's theatres, they claim that Mr. Johnson's hostility has prevented them from doing so. It is also the Local's contention that the CIO set-up recognized by the corporation is nothing but a company union and as such does not truly represent the best interests of its employees.

- Hi Berling, former business representative for Local 380, Oklahoma City, recently won a new Buick car in a Turtle Derby sponsored by Variety Club Tent 22. He entered five turtles in the derby—Mo, Sol, Sid, Abe, and Izzy—all named for close friends. "Izzy" came through with flying colors—while Hi hit the jackpot.

- Under the management of Roy Thompson, member of Local 88, Waterbury, Conn., Hogan's Irish House on West 52 Street, N. Y. City, has become a popular rendezvous for IA men, local and visiting. President Walsh and many other IA executives are frequent patrons—a pretty sure indication that Thompson is delivering top-rate service and food.

- Ralph Root, Sr., business representative for Local 236, Birmingham, Ala., is mighty proud of his offspring, Ralph, Jr., and for an excellent reason. Root, Jr., now 25 years old, served three years with the U. S. Army Signal Corp in World War II, and is the proud possessor of campaign ribbons denoting service in the European, African and Middle East invasions.



Ralph Root, Jr.

A student at Georgia Tech, Ralph, Jr. graduates shortly with a B.S. in Electrical Engineering. He is prominent in extra-curricular activities, being president of the "Wand and Rabbit Club," and public relations officer for the "Latin American Club," the latter being composed of students from South America. He is a member of the Georgia Tech Chess Team and a student member of the Institute of Radio Engineers.

Ralph, Jr. was always interested in all phases of projection work and became a member of Local 236 in 1946. He informs us that the copies of IP sent to the college reference library get a pretty thorough going-over each month and rate high on the request list.

- The sudden passing of Sid Burton, member of Los Angeles Local 150 since 1915 and top-flight projection man, saddened his many friends in the Alliance. Sid, loved and respected by all who came

in contact with him, was never known to turn down a needy friend. He served the Local in various official capacities and directed many of its educational activities. Sid was buried with Masonic services. We sympathize deeply with his survivors.

- Shirley Brown, daughter of the late Ben Brown, of Pittsburgh, Penna., is now playing one of the leading roles in the musical "Lend an Ear." We remember Shirley as a very talented youngster, and we predict a bright future for her in the entertainment world.

- Pay increases of \$4.50 per week for exchange workers negotiated with eight distributors earlier this year have now been extended to all companies signing blanket exchange contracts with the IA. Signing of contracts with Eagle-Lion completed agreements with the four remaining unsigned companies—United Artists Monogram and National Screen Service.

- As titular head of LLPE (Labor's League for Political Education) for the International Alliance, Dick Walsh collaborated with the New York State 10th District in sponsoring a luncheon last month in honor of former governor Herbert H. Lehman, candidate for U. S. Senator, and Mayor Wm. O'Dwyer, of N. Y. City, Democratic nominees (both elected, incidentally). The luncheon was attended by hundreds of representatives of theatrical labor unions in the State.

To Tom Murtha, president of the 10th District, who was in charge of arrangements for the luncheon, the affair had a special significance, for in his early days he and Mayor O'Dwyer were members of the N. Y. City police force and worked the same beat.

- Cecil R. Wood, Sr., member of Local 306 and president of the 25-30 Club, of N. Y. City, was honored recently by his employers, Pathe France, Inc., at a surprise breakfast party in commemoration of his 50th anniversary as a projectionist. Cecil's energy and enthusiasm belie his 76 years.

- We were glad to hear that our good friend, Ralph Kautzky, Altec Service inspector for the Broadway (N. Y. City) area for many years, has been promoted to the post of New York suburban field manager, covering New Jersey and up-state New York. Kautzky was extremely popular with the boys along Broadway, and he has their best wishes in his new job.

- A new exhibitor outfit opened a drive-in theatre in Kingsville, Texas (Corpus Christi 604 jurisdiction) with non-union projectionists. Several attempts to arrive at a working agreement with the exhibit-

ors failing, the Local established a picket line. Five weeks of intensive picketing did the trick, and contracts were signed with the Local. D. A. Brandon, business representative, and Chester Kyle negotiated for Local 604.

- When Bill Covert, 2nd vice-president of the IA, and business representative for Local 173, Toronto, Canada, returned from the ILO (International Labor Organization) conference



Wm. P. Covert

in Geneva, Switzerland, which he attended as a technical labor adviser, he praised the aims and purposes of this body. With delegates from 65 countries participating in the sessions, this 32nd international conference considered such topics as, for example, international minimum

standards, industrial relations, vocational guidance, employment agencies, migration for employment, wages, working and living conditions, and other matters relating to social-labor legislation.

"If the ILO is to achieve its objective and to maintain its pre-eminent position in the field of international labor relations and be a guide to social and economic progress," said Covert, "it must adapt itself to the age in which it has its being; for the best legislation is but a temporary expedient that a later and wiser age will efface. It cannot and must not stand still—and governments must also be prepared to change their policies in an ever-changing world, if they hope to progress."

Bill is very proud, and justly so, of his part in this step toward a world brotherhood of man.

- *Recent out-of-town visitors to the office of IP:* Frank (Bud) Long, Jr., St. Louis Local 143; Dennis F. Harrington, Saratoga Springs Local 592; William (Bill) Hartnett, Ottawa Local 257; David H. Koskoff, Los Angeles Local 150; F. A. Hindemith, Port Jervis, N. Y. Local 353, and Wm. F. Brobacker, Middletown, N. Y., Local 311.

- The officials of Local 486, Hartford, Conn., were commended by local newspapers for their splendid cooperation in the recent Hartford Community Chest drive. Through the efforts of Donald McDonnell and Charlie North, secretary and business representative, respectively, free motion pictures were shown for three hours every night during the campaign.

- Six months of negotiations by Local 159 with the Jones Enterprise Theatres

(Continued on page 29)

# 'Dancing Shoes' Sequence in 'Barkleys' a Marvel of Cinema Technique

EVER since the release by Metro-Goldwyn-Mayer of the "Barkleys of Broadway," Fred Astaire-Ginger Rogers starrer, IP, no less than its readers, has been ruminating on the means employed to achieve the "dancing shoes" sequence therein. Not since "Topper" intrigued audiences a decade ago with startling photographic magic has a cinematic effect so fascinated moviegoers as did this "Barkley" job.

IP is indebted to the *American Cinematographer*\* for the appended description of the technical processes involved in producing the startling "Barkleys" photography.

In this sequence Astaire portrays a cobbler whose shop is frequented by theatrical folk. A dancer brings him a pair of dancing shoes to have the taps adjusted, and before leaving executes some nifty steps before the awe-struck Astaire. When the shoes, with nobody in them, suddenly do a few tap steps, Astaire looks at them in amazement, then decides to try them on. The shoes all but "carry him away." As they go through lightning steps, Astaire's body tries desperately to keep up with them.

## 12 Shoes Alone Dance Rhythmically

Suddenly, other dancing shoes magically appear on the counter, tapping to the music. Then six pairs tumble down from the shelves back of the counter and execute a routine around the startled Astaire, who, still wearing the dancing shoes, joins in, culminating one of the most effective dance numbers ever staged.

Astaire dreamed up the idea for the sequence, planned it out on paper, then took it to Irving Ries, M-G-M's wizard of optical printing. From here on it was Ries' baby, and what he did with it proves conclusively that his well of cinematic wizardry is far from dry despite his 25 years of concocting optical legerdemain at M-G-M.

Together with Ries, Astaire worked out the dance routines, then tests were shot in black-and-white. When the routine was perfected, and the action was carefully plotted to jibe with the requirements of optical printing, they went on the set and photographed the routines in Technicolor. The action was carefully cued to a playback of music and taps.

## Blackout of Dancers' Forms

When a satisfactory take of the basic scene was completed, the set was cleared of players, then completely draped in black velvet. The "invisible" tap dancers—six in all—were then photographed as



Clip from "Barkleys". Shoes tumble from shelf and dance around Astaire. Shoes, which were superimposed, were first photographed on dancers masked in black against a black background, after which they were printed in by the travelling-matte process.

they went through their dance routine over in front of the black backdrop. The dancers were dressed in black tights and shirts, their hands covered with black gloves and their faces similarly obscured with black masking. Only their white shoes were visible.

Guide marks placed on the velvet covering the floor served as a guide for the dancers, so their movements would be kept in proper relation with that of Fred Astaire when the two takes were superimposed. A pair of ballet slippers also enter the scene momentarily on invisible dancing feet, and this required still a third take, which was likewise superimposed—a matter that required careful and exact timing.

As if the problem of superimposing six pairs of dancing shoes—actually dancing, that is—were not enough to toss in the lap of Ries for one production, Astaire also thought it would be a good idea to have the shoes jump from the shelves back of the counter onto the shop floor, at the beginning of the dance. Shoes, especially with feet in them, just don't fit in narrow shelves, and besides the black-masked dancers would have to stand upright in order to execute the jump.

Ries solved this problem by having the top row of shelves cut off for this take. This enabled the dancers to stand on the next row of shelves, begin the routine with a few tap steps, jump to the floor and continue tapping. The top section of shelving was later replaced for the balance of the sequence.

## Shoe Visibility; Multiple Prints

The big problem encountered by Ries was that of keeping each dancing shoe visible in its entirety at all times, except when it passed momentarily behind Fred Astaire dancing in the middle of the floor. Normally, when a dancer's leg

crossed between camera and the shoe on the opposite foot, that shoe would be obscured from the view of the camera. In order to make the illusion of the shoes dancing alone seem real, it became necessary to "fill out," or complete, the image of those shoes thus obscured in the original negative.

Ries solved the problem by employing simple animated cartoon technique. He first projected frame by frame on animation celluloids, or "cells," that portion of the negative showing the obscured shoes. An artist outlined the missing portions of the shoes on the cell, later inked them in, and Ries photographed it. The result was superimposed in the printing.

As the picture was being photographed in Technicolor, this meant that the cells had to be photographed three times—once for each of the three color negatives that comprise the Technicolor system. Subsequently, these negatives were combined with the first to produce the complete image. "From there on," said Ries, "it was just a matter of routine matte printing."

## Travelling Matte Process

Although "routine" to Ries, the technique of travelling matte printing still is something of a mystery even to many professional moviemakers, and would require more space than is available here to explain it fully. But roughly, it consists of superimposing a figure (or figures) in a scene when printing the film, rather than by double exposure, as in early days of cinema trickery. The travelling matte, which is made photographically, consists of a strip of clear film with the area corresponding to that of the figure to be printed in being fully opaque. This, when combined with the negative, leaves unexposed on each frame of the film the area that will be occupied by the figure to be superimposed in a subsequent printing step.

In the case of the "dancing shoes," a matte was made to blank out the area on each frame representing the shoes. This allowed the shoes subsequently to be printed-in, a step which, because of carefully controlled exposure and printing light, made the shoes appear as though they were photographed simultaneously with Fred Astaire.

"The dancing shoes sequence," said Ries, "required two months to conceive and execute. We shot all the action on stage in three days. The rest of the time was spent in making the mattes, doing the animation work and, finally, the printing."

**PROJECTIONISTS'**  
**\$300** **SERVICE**  
**MANUAL**

\* September, 1949, issue: "The Dancing Shoes," p. 318.

# ★LOOKING BACK-TO THE FUTURE★

While reviewing a book recently we suddenly became aware of how easily one can forget information of a fundamental nature as one progresses to more advanced equipment and technique. This train of thought was responsible for this, we think, aptly-headed de-

partment which, to be a regular feature of IP, will cover a variety of topics and will serve the dual purpose of providing basic information to the younger craftsmen and as a review for those of long service.

Fittingly enough, this department's inaugural presentation is an excerpt from the aforementioned book.†

**R**EFLECTION is the means by which most things are made visible to our eyes. This page is made visible because light from the sun, or more probably from an artificial lamp, is reflected from this page to your eye. Many light rays are reflected this way at any one time, and your eye sees the sum total of all of these rays. Paper is, however, not the best reflector: in fact, it is comparatively poor in that respect. The ideal device is the mirror, which is specially constructed for that purpose.

Although in any case of reflection there are always many light rays involved, it is convenient for our purpose to trace the action of one single ray at a time. A *plane* surface is one which is entirely flat, such as a pane of glass.

In Fig. 1 the plane surface may be assumed to be a smooth highly polished piece of metal. The light ray issuing from point *P* falls upon the reflecting surface and is turned back from the surface at the same angle at which it arrived.

To explain this condition, an imaginary line is drawn at right angles to the reflecting surface at the point *O* where the arriving light ray meets the surface. This imaginary line, *AOB*, is known as the *normal* and is always perpendicular to the reflecting surface. Use of the normal

FIG. 1. A single light ray reflected from a plane surface. The angle of incidence (*i*) is equal to the angle of reflection (*r*).

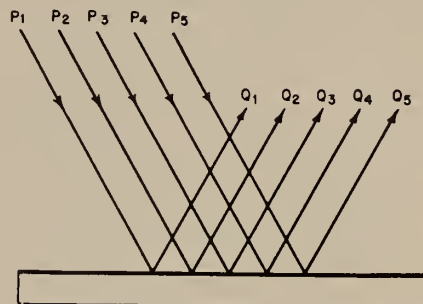
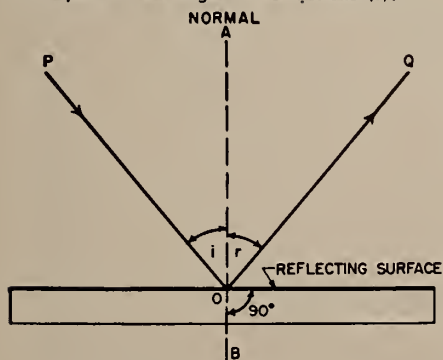


FIG. 2. Regular reflection occurs when light strikes a plane surface. In this case all the incident angles are equal to each other.

line in the illustrations concerned with the action of light will serve as a handy reference; however, it must be remembered that it is drawn only for reference and that it does not really exist.

In accordance with the laws of physics, the angle that the incident, or arriving,

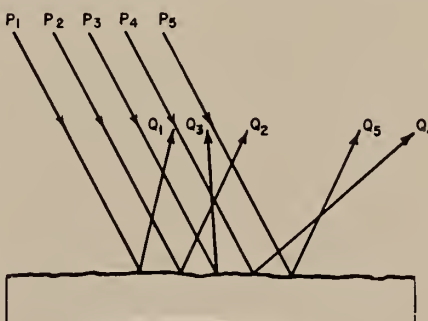


FIG. 3. Irregular, or diffuse, reflection occurs when light strikes an uneven surface. The angles of incidence are different from each other, although each incident angle is equal to its own angle of reflection.

light ray makes with the normal is equal to the angle which the reflected, or departing, light ray makes with the same normal. In other words, *POA* is equal to *AOQ*, or the angle of incidence, *i*, is equal to the angle of reflection, *r*.

If the angle between light ray *PO* and the normal *AOB* is 45 degrees, then the angle between light ray *OQ* and the normal will be 45 degrees. If the incident

light ray were along the normal line *AOB*, the reflected ray would follow the same path back from the reflecting surface.

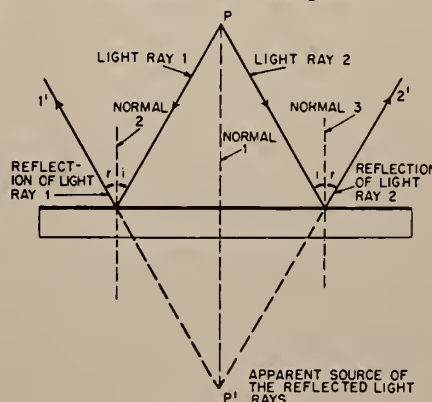
There are, however, many different qualities of reflection, some materials being better reflectors than others. An example will help make this clearer.

*Regular* reflection, illustrated in Fig. 2, occurs when light strikes a mirror or other smooth flat shiny objects and the rays are reflected in a uniform manner. Automobile windshields may reflect a great deal of light from the sun when the angle is right and this light may be reflected into another driver's eyes, causing a safety hazard. An ordinary piece of plain glass may act as a mirror if not viewed directly head-on.

*Irregular* or *diffused* reflection, shown in Fig. 3, occurs when light strikes uneven surfaces, and since all the light rays travel in different directions after being reflected, there is not a great quantity of light in any given direction. Thus it is impossible to reflect any useful amount of light from a blotter or rug or any similarly rough surface—most certainly not the glare which may be produced by reflecting light from an automobile windshield or even a water tumbler.

The mirror, shown in Fig. 4, is front-surfaced, such as is used in cameras,

FIG. 4. In a front-surfaced mirror, reflection is from the front surface of the glass. The apparent source of the image is behind the back surface of the glass.



† "Tv Projection and Picture Enlargement," by Allen Lytel; published by John F. Rider, Publisher, New York. See review on page 30.

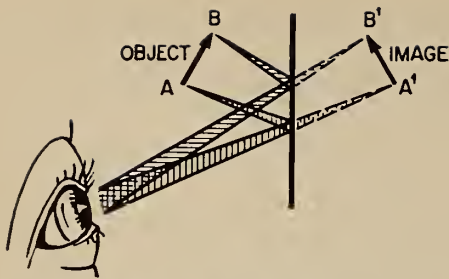


FIG. 5. The virtual image  $A'B'$  appears to be in back of the mirror. It is the same size as the object, and vertically erect, although reversed horizontally.

optical systems, and projection television. As may be seen, the light is reflected from the front surface of the glass, and since the light does not pass through the glass at all, there is no loss in brilliance. This type of mirror is used wherever it is important that the greatest possible image brilliance be obtained, as in TV projection.

Because the front surface is made reflecting, the front silver-like coating may be scratched or damaged very easily; hence mirrors of this type should never be cleaned unless absolutely necessary, and then only with absorbent cotton dipped in clean water. Even fingerprints can destroy this front-surfaced mirror because the reflecting coating is exceptionally thin. The mirrors should always be handled with extreme care and no fingermarks should ever be left on the surface. These mirrors should always be handled by the edges or back where possible.

Referring to Fig. 4, point  $P$  is a source of light, or an object which reflects light, and its image is to be formed in the mirror. Many light rays leave it, some of which strike the mirror and create the image which is the reflection of the object. Although the action of only two rays is shown in Fig. 4, it is understandable that a similar action will take place for all of the rays which impinge upon the mirror. Light rays 1 and 2 issuing from point  $P$  will be considered in the analysis.

#### Path of the Light Rays

Normal 1 is a perpendicular dropped from  $P$  to the surface of the mirror; normal 2 is drawn perpendicular to the reflecting surface where light ray 1 strikes the mirror, and normal 3 is the same where light ray 2 strikes the surface. Being a flat surface, regular reflection takes place, the reflected rays being  $1'$  and  $2'$ .

Now, if we forget for the moment that rays  $1'$  and  $2'$  are reflected and consider them as simply issuing from the mirror, there must be a point of origin for these rays. This point may be determined by extending these reflected rays with imaginary lines through the mirror.

This is done in Fig. 4 with the dashed lines. They meet at  $P'$  and this is the apparent source of the reflected light rays  $1'$  and  $2'$ . These rays seem to come from behind the mirror, and this point  $P'$  is as far in back of the reflecting surface as the original source  $P$  is in front of the surface. The point  $P'$  is known as the virtual image point.

#### Image Dimension, Orientation

Referring again to the incident and reflected waves, the angles  $r$  and  $i$  for rays 1 and  $1'$  and 2 and  $2'$  are equal in accordance with the basic laws of reflection as previously stated. Two very significant conditions associated with reflections from such plane mirrors must be

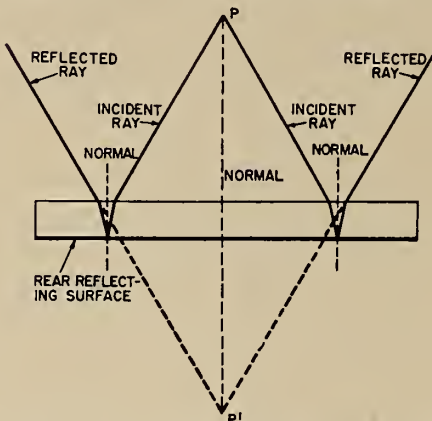


FIG. 6. In a rear-surfaced plane mirror, the incident ray bends at the front surface of the glass as it enters the glass. Reflection is from the rear surface, although the image seems to come from behind the mirror.

mentioned. These are the dimension and orientation of the image which takes place during the reflection process.

Let us examine another example of such reflection, this time considering the dimensional relationship between the real image and the virtual image. This is shown in Fig. 5. The object being reflected is the arrow  $AB$ . Two rays are shown issuing from points  $A$  and  $B$ . These are reflected by two pairs of rays to the eye, as shown. Since images in a plane mirror seem to come from in back of the mirror, we can determine the apparent source of these reflected rays by extending them back through the mirror. This operation develops the virtual image  $A'B'$ . Now if we measure the dimensions of the real image  $AB$  and the virtual image  $A'B'$ , we note that the two are of like size. In other words, reflection in plane mirrors neither magnifies nor reduces the image dimension. This is a very important point in connection with the means for accomplishing magnification of the image.

Another point of importance associated with reflections in plane mirrors is the relative orientation of the reflection. As

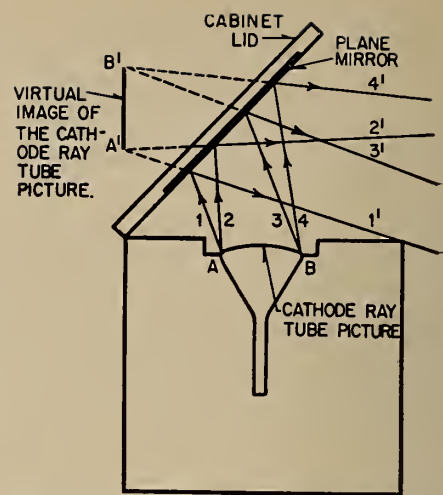


FIG. 7. Diagrammatic representation of reflections in a television receiver where a plane mirror is used for viewing.

the consequence of the action of reflection in plane mirrors, which gives an image behind the mirror, the orientation of the reflection is reversed (with respect to the object, not the observer) along the horizontal plane: that which is right in the object appears to the left in the reflected image, and *vice-versa*.

Vertically the image is erect, that is, the top and bottom portions of the reflected image are in the same relation to each other as the object, but not so the left and right portions of the image with respect to the object.\* This, too, (Continued, foot of next page)

\* That is, the reflection of a right-hand glove, fingers pointing up, would look like a left-hand glove, fingers pointing up.

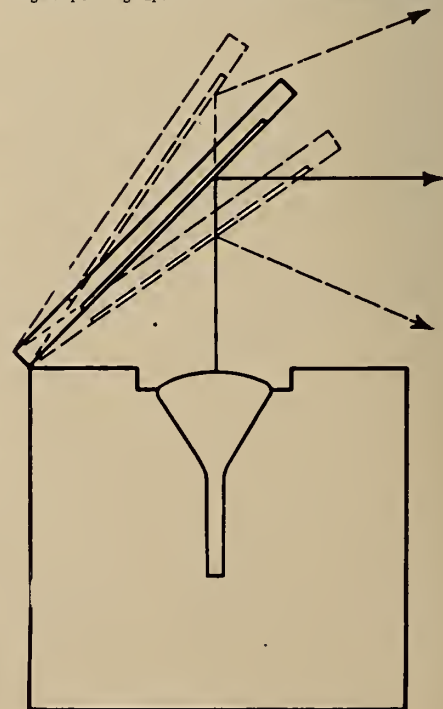


FIG. 8. Changing the tilt of the plane mirror changes the position of the image and the proper viewing angle.

# Proposed American 35-mm Film Perforation Standard

THE proposed American Standard for a common type 35-mm film perforation for both positive and negative film, which is illustrated here, has been promulgated by the Society of Motion Picture Engineers for a 90-day trial and criticism. It is now being proposed to the American Standards Association for adoption in order to solve the registration problems that exist in the printing of certain types of color release prints.

It is possible to meet the problems of exact registration needed for color prints by the use of cine negative perforations in the release prints. However, many people are reluctant to do this because they fear that they cannot in this way make release prints which will have satisfactory projection lives. [NOTE: See "Safety Film: Projection Factors," in IP for November 1948, p. 9, for examples of color film perforations.—Ed.]

One answer to this problem is the use of combination positive and negative perforations as shown here in the proposed new standard. While the problem of preparing satisfactory color release

prints is the reason for the presentation of this proposal, the whole question of 35-mm standards is involved.

The problem is an old one, dating back to 1916, and those especially interested in the matter may obtain bibliographical data thereon through the SMPE.

## Standards Appendix

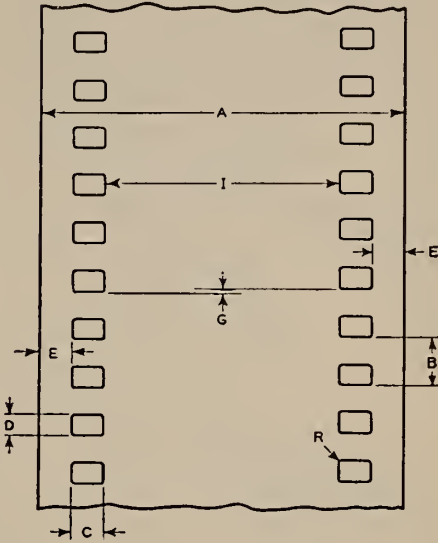
The dimensions given in this standard represent the practice of film manufacturers in that the dimensions and tolerances are for film immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but owing to the fact that film is a plastic material, the dimensions of the slit and perforated film never agree exactly with the dimensions of the punches and dies.

Shrinkage of the film, due to change in moisture content or loss of residual solvents, invariably results in a change in these dimensions during the life of the film. This change is generally uniform throughout the roll.

The uniformity of perforation is one of the most important of the variables affecting

FIGURE 1

Proposed American Standard  
Cutting and Perforating Dimensions for  
35-Millimeter Motion Picture  
Combination Positive-Negative Raw Stock



## LOOKING BACKWARD . . .

is an important point because it is taken into account in TV reflection systems.

### Reflection from a Rear-Surfaced Plane Mirror

The ordinary mirrors used in homes are made of plate glass, with the reflecting surface located at the rear of the glass. Light must travel through the glass, and out again as in Fig. 6. Mirrors of this type actually do not present as clear an image as the front-surfaced mirror because some light is absorbed during its passage through the glass. Although the light has to pass through the glass twice—once on its way in and once on its way out—the amount of light reflected is usually sufficient for all practical purposes.

Another difference in the process of reflection taking place in rear-surfaced mirrors with respect to front-surfaced mirrors is *refraction*. The light rays which pass through the glass are slightly bent as shown in Fig. 6. This causes a certain amount of distortion, which is not noticeable in the average plane mirror employed in the home, but it does become a major factor in precision optical instruments. The amount of refraction shown in Fig. 6 is far in excess of that normally encountered and is used solely for illustrative purposes.

### Use of Plane Mirrors in Tv

The combined action of reflection and image reversing in a plane mirror has

(Continued from preceding page)

been and still is in use in Tv receivers. Prior to the war, RCA, GE, and several other manufacturers produced Tv receivers wherein a hinged mirror, tilted at a 45° angle and located above the cathode-ray picture tube, afforded a reflected image of the picture on the cathode-ray tube screen. The process of reflection is shown diagrammatically in Fig. 7.

In order to compensate for the reversing action which takes place during reflection, the orientation of the picture on the cathode-ray tube must be such as to make the picture appear correct when viewed in the mirror. This is accomplished by electrically reversing the picture on the tube screen and utilizing the reversing action during reflection to make the picture normal.

For the purpose of discussion, assume for the moment that the face of the cathode-ray picture tube is flat, instead of slightly convex. As we saw in Figs. 4 and 5, and the text describing them, there is an apparent vertical image of the tube face whose position depends upon the positions of the mirror and the tube. Fig. 7 shows the location of the virtual image with the mirror at 45°.

Figure 8 shows the change in angle of the reflected center line ray as the mirror is tilted either side of 45°. In use the image of the tube face is tilted slightly backward, indicating that the mirror is raised to slightly more than 45°.

steadiness of projection. Variations in pitch from roll to roll are of little significance compared to variations from one sprocket hole to the next. Actually, it is the maximum variation from one sprocket hole to the next within any small group that is important.

### Preliminary Work Dates Back to 1932

Perforations of this size and shape were first described in the Journal of the SMPE in 1932 by Dubray and Howell. In 1937 a subcommittee report reviewed the work to date. The main interest in the perforation at that time was in its use as a universal perforation for both positive and negative film.

The perforation has been adopted as a standard at this time largely because it has a projection life comparable to that of the perforation used for ordinary cine positive film, and the same over-all dimensions as the perforations used in the negative film.

FIGURE 2

Dimensional data relative to Fig. 1.

Key	Inches	Mm.
A	1.377 ± 0.001	34.98 ± 0.025
B	0.1870 ± 0.0005	4.750 ± 0.013
C	0.1100 ± 0.0004	2.794 ± 0.01
D	0.073 ± 0.0004	1.85 ± 0.01
E	0.079 ± 0.002	2.01 ± 0.05
G	Not > 0.001	Not > 0.025
I	0.999 ± 0.002	25.37 ± 0.05
L*	18.70 ± 0.015	474.98 ± 0.38
R	0.013 ± 0.001	0.33 ± 0.03

These dimensions and tolerances apply to the material immediately after cutting and perforating.

\* This dimension represents the length of any 100 consecutive perforation intervals.

**Y**OUR Monthly Chat in the July last issue (we are a long way down in the blue Pacific) was extremely interesting. After reading the many discussions in IP, I was wondering when American equipment manufacturers were going to stumble onto the simple solution of their big headache of an effective means for cooling the aperture area of the projector regardless of the ampere load of the arc.

The aforementioned column lists in order four possible solutions of this problem: Glass Filters, Carbon Jaw Water-Cooling, Air-Cooled Aperture, and Water-Cooled Aperture. Why leave the most important and obviously simple solution to the last?

Like so many of our modern (?) ideas, water-cooling of the projector gate is an old dodge. To the best of my knowledge, German engineers first employed this tactic in 1933-34, and during the latter year introduced what was to my mind one of the finest projector mechanisms ever produced—the Ernemann V “cold” projector. Here is the statement made by Ernemann engineers in 1934:

“The criterion of projector quality is no longer confined . . . to smooth running, absence of travel-ghost and steadiness of the projected image. These qualities are taken for granted. The test now relates to the manner in which the effects of heat upon the film and other vulnerable components are met.

“In order to bring out the full artistic potentialities of the film, persistent endeavors have resulted in the use of more and more powerful arc lamps. The consequent greater intensity of the accompanying heat has a deleterious effect upon the sharpness of the picture image and the quality of the sound reproduction. In these days preference should rightly be given to a projector in which the effects of heat are reduced to a minimum.”

#### **Air- Plus Water-Cooling**

The following observations by Ernemann engineers would seem to bear directly upon the recent contribution to the literature by F. J. Kolb,<sup>1</sup> of Eastman Kodak Co., which has had frequent mention in discussions of this problem of cooling picture equipment.

“The Ernemann II projector (1925-26) has blower tubes incorporated in it, and all succeeding Ernemann mechanisms are equipped with built-in, air-cooling attachments whereby air is blown against the film from either side. The air-cooling system ensures effective cooling of the film *within the film gate*.

“In consequence, however, of the great intensification of the illumination of the picture, a *new* source of trouble has arisen

<sup>1</sup> “Air-Cooling of Motion Picture Film for Higher Screen Illumination,” presented at the Spring, 1949 Convention of the Society of Motion Picture Engineers.

# VIEWS

## from the

# ANTIPODES

*Exemplifying the adage that we need not so much to be told as to be reminded are these forthright observations by one who obviously has had long and varied experience in the craft—and a good memory.*

By DOUGLAS McMURRAY  
Sydney, Australia

by reason of the *heat communicated by radiation to the film track*.

“In contrast to air, water is endowed with extraordinary capacity for taking up heat. *Cooling by a stream of water* is accordingly the appropriate expedient for carrying away the heat from the film track . . . and for maintaining that general area at a low temperature *irrespective of the working ampere load*. Cooling by this method obviates the formation of film deposits as well as . . . bulging or ‘reaching’ of the film.

“The *joint* effect of water- and air-cooling establishes model conditions for the travel of the film through the projector. . . . The growing popularity of color film demands a further intensification of the light and a greater tendency to heating.\* It follows that the water-cooling system is bound to gain in significance.”

#### **Easy Adaptability Cited**

This, bear in mind, is what the Ernemann engineers thought as far back as 1934! The entire system is simplicity itself and could be easily adapted to any projector. Instead of a solid gate

\* Relative to this point is the following interesting excerpt from the aforementioned paper by F. J. Kolb:

“Additional evidence for believing that only the image absorbs energy is given by the behavior of dye-image films which are relatively transparent in the near infra-red, even for relatively high absorption and density in the visible region. Such dye-image films show less heating and less of the thermal effects than silver-image film when projected at the same intensity. We have found this advantage to be roughly proportional to their transparency in the infra-red.”

casting, the Ernemann gate was made with hollow chambers. Water was attached to an input tube, and the continuous overflow fed back through another tube to a tank or a drain.

With water circulating through the gate, it is impossible for a projector to get any warmer than the palm of a projectionist's hand. It matters not whether the lamp is pulling 50 or 250 amperes, the film will not be adversely effected by heat to any degree.

I note in IP a report that Century jector Corp., is now equipped with a water-cooled jacket. Century is at last on the right track, but it can go even farther to its own advantage by redesigning the gate itself. If American designers were to adapt the Ernemann idea of water-cooling to their projectors, they could lick this heat problem overnight. The writer would wager that if this were done there would be a ton of glass heat filters going cheaply.

It is interesting to note that the British regard the Ernemann V projector so highly that they are now making almost an exact copy of it in the form of the Walturdaw V.

I gather that there are no Ernemanns in use in America. [NOTE: Not in the U.S.A., but there are a few operating in Canada, and numerous such units in Central and South America.—Ed.] The reason for this is probably the open design, which American projectionists regard as a bit strange and, perhaps, a big fire risk. This really is not true, however, and I only wish that the boys in the States could see and operate this mechanism.

#### **Ernemann Design Details**

I do not wish for one minute to decry American projectors, which have proved their worth throughout the world; but I sincerely believe that much could be learned from a careful study of the basic Ernemann design. Brenkert would seem to have profited by such study, since all Ernemann models from the II on were automatically lubricated.

As far back as 15 years ago the Ernemann V was a water- and air-cooled projector. The gate was of the long design, with all tension easily adjustable *while running*. The gate has a removable aperture plate which could be fitted with velvet ribbon runners to render unnecessary the waxing of new prints.

Inside the projector was a mercury switch which was connected to a trip immediately above the top feed sprocket. If the film ever parted in the gate, the top loop would build up, release the trip lever, and the mercury switch would then cut off the projector motor and the exciter lamp. The same switch could also be used to drop all port shutters at the same time. The Zeiss Ikon system

kept all ports open by means of electromagnetic devices.

### Notable Progress in Optics

The standard lens jacket on the Ernemann V was made to take Zeiss lenses of from 3½ to 4-inch aperture having a speed of F:1.9—which speed is precisely what the “experts” are now urging projectionists to use in order to combat faulty light distribution on the screen.

I have not had the opportunity to see any coated projection lenses from the German companies, but the British know that the Germans have been very active in this field. They are unable to get any definite information regarding German research because the Zeiss factories (where the Ernemann projectors were manufactured) are in the Russian-occupied zone and are therefore cut off from the rest of the world.

German engineers are credited with having made the statement recently that if they could scrap all their present machine tools and patterns and start all over from scratch, they would make a projector the like of which the world has never seen. Bragging? Perhaps; but it would be foolhardy to sell them short in view of their prior fine achievements in this field.

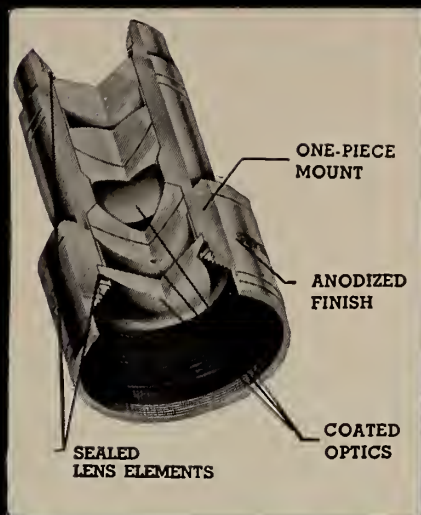
## NEWS PROJECTIONS

*Jottings of happenings which, while mostly of a non-technical nature, have a bearing upon general industry welfare and progress.*

**E**ASTERN labs have upped their prices by 8 per cent, with the advance being caused, it is said, by the recent 11½ per cent wage hike won by IA lab workers Local 702. . . . Nov. 17 ended the 30-day grace period for the filing with the U. S. District Court in New York of final proposals for splitup of Loew, Warner and 20th-Fox theatre holdings. . . . All major companies now shutting their top stars around the country as an aid to better biz. . . . Paramount has won two additional years in which to divest itself of holdings in the Michigan Butterfield circuit. . . . Only 13 per cent of those queried in a recent survey by Woodbury College students are willing to pay a “nominal” sum for Tv programs.

J. Arthur Rank, British film tycoon, discloses he lost \$9,380,000 in film production during the year ended last June 25. This figure would have been about 30 percent higher in dollars before the recent devaluation of the British pound. The almost confiscatory nature of the British entertainment tax is reflected by Rank's statement that “we have paid out of our theatres, entertainment tax which exceeds our loss by \$2,800,000. . . . American ex-

# f/1.9 SUPER-SNAPLITE



*Question Box*

No. 10

### IF THE SPEED OF THE LAMP IS SLOWER THAN THE LENS, WHY USE A FAST LENS?

This is answered in detail in an article by Dr. J. L. Maulbetsch in the “International Projectionist” of September, 1947. In brief, a fast lens gives more uniform illumination because having larger lens elements it picks up more of the edge illumination than a slower lens with correspondingly smaller lens elements.

### ARE ADAPTERS NECESSARY FOR SNAPLITE LENSES?

Fittings are available to adapt, where necessary, Snaplite lenses to all currently manufactured professional projectors.

### WHERE CAN DRAWINGS OF THESE ADAPTERS BE OBTAINED?

The required adapters are shown on the last page of Kollmorgen bulletins 204 and 206. These bulletins are available at your theatre supply dealers. Dimensions of all adapters except the shade tube are fixed. The length of this shade tube varies with the focal length of the lens.

### HOW MANY LENS ELEMENTS ARE THERE IN A SUPER-SNAPLITE?

Six—two pairs of elements are cemented together and two elements are single.

### ARE THE CEMENTED SURFACES COATED?

No—treating cemented surfaces with an anti-reflection coating would not increase the light transmission of the lens.



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hibitor organizations are getting definite commitments from Congressman for a sharp reduction in the admission tax. . . . Fifty good-sized theatres equipped for Tv and interconnected could make possible the programming of exclusive Tv programs, says N. L. Halpern, Tv consultant for Fabian Theatres. . . . Canadian theatres in 1948 took in a record gross of \$69,619,047, which is \$6,753,768 more than in 1947. . . . Potentialities of advertiser-sponsored features, offered to exhibitors without charge, and to be played at minimum admission prices, are being explored.

Competition has been eliminated in the Detroit area by theatre groups who

have operated collusively and dictate terms on a take-it-or-leave-it basis, said indie producer Sam Goldwyn. . . . Motion picture stocks are regaining their former position as sound investments, says the Wall Street Journal. . . . A. F. of M. scale for members working in Tv films revealed as \$27 per man for each film program of 15 minutes or less. . . . More than 8000 U. S. theatres have played reissues during the past year. . . . Du Mont asserts it is perfecting a system of non-flicker color Tv which will "employ principles used in the continuous motion picture projector." (Ala the old Mechau rotating wheel with 36 individual lenses?). . . . Paramount expected to acquire total ownership of Wilby-Kincey Circuit by year's end. . . . More than 20 regional

exhibitor outfits have readied petitions to FCC for theatre Tv channels.

Believe it or not, RCA has added playground equipment to its drive-in theatre line. (Shades of popcorn, etc.). . . . Latest Canadian theatre figures list 326 houses open, 110 under way, and 142 planned. . . . General Precision Equipment Corp. (parent company of numerous motion picture manufacturing units) reports \$88,367 net profit, equal to 15 cents per common share, for three months ending Sept. 30 last.

## Bausch & Lomb's 97th Year

Ninety-six years ago last Nov. 2 a small optical shop opened its doors in Rochester, N. Y., offering for sale a few thermometers, field glasses, magnifiers and horn-rimmed spectacles. Today the Company founded by John J. Bausch and financed by the \$60 life-savings of a friend, Capt. Henry Lomb, is the world's leading producer of scientific optical instruments.

During the Civil War, with Captain Lomb sending home his Army pay to keep the company going, Bausch built and installed the first power lens grinding machine in America. A short while later he literally stumbled upon the use of vulcanized rubber for eyeglass frames when he found a chunk of the hard, black material on the street. Before the war ended, the cookstove in the Bausch kitchen was converted into one of the first plastics "laboratories" in the U. S.

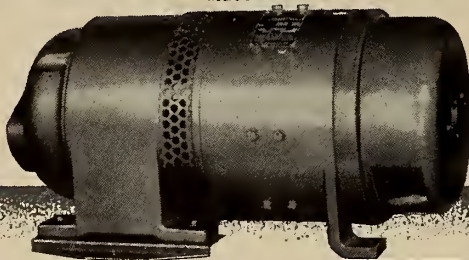
In 1915, William Bausch, younger son of the founder, climaxed several tedious years of glass-making experiments by producing the first pure melt of optical glass ever made in America. By the time the U. S. entered World War I, B. & L. became the sole source of supply, not only of optical glass, but of gunfire control instruments as well.

Since then, scores of new products have been added, and two additional plants opened at Wellsville, N. Y., and at Midland, Canada. Among the many new items are phase con-

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Unretouched shadowgraphs, showing Audiodiscs recorded at 78, 45, and 33 1/3 rpm. These representations magnified 125 times.

trast microscopes; a tiny, plastic gonioscope for diagnosing glaucoma, one of the principal causes of blindness; tension-type eyeglass frames, a series of wide-field microscopes and home movie lenses that rival the B. & L. Baltar lenses used by Hollywood cameramen, a television slide projector, and an ultraviolet microscope for cancer research. A vibration-proof underground laboratory for making diffraction gratings for spectrographic analysis was also completed.

#### New F:1.3 Balowstar 16-mm Lens

The new F:1.3 Cine Balowstar lens has had its first demonstration in N. Y. City. Designed and executed by Dr. F. G. Back, creator of the internationally famous "Zoomar" lens, the Balowstar is said to do for motion pictures what the image orthicon does for video—transmits color perfectly under a minimum of lighting. Everything visible to the naked eye—even the flicker of firelight—can be captured on film.

This so-called "Night-Hawk" of lenses, with its aperture range of from F:1.3 to 16, focuses from infinity down to 4 feet. It is adaptable to any 16-mm camera.

#### New Kodak Mexico City Plant

Kodak Mexicana, Ltd. has opened its new quarters, embracing 35,000 square feet, in Mexico City and is operating as the latest link of the modernization program now underway by Kodak to provide more complete decentralized service in key geographical centers.

### PERSONNEL

JAMES FRANK, JR. has been named vice-president in charge of sales for Theatre Control Corp., Detroit company which is marketing nationally the Ticograph device which automatically audits motion picture theatre admissions. FRANK, formerly with RCA and with National Theatre Supply Co., is a governor of the SMPE.

RALPH M. EVANS, superintendent of Eastman Kodak Co.'s color control department, received the Samuel Warner Award of the SMPE at the latter organization's recent 66th convention in Hollywood. The award is presented annually for outstanding work in the motion picture field.

DR. E. M. HONAN, one of America's recognized authorities on the development of sound in the motion picture field, who until his retirement on Sept. 30 last was engineering manager of the ERPI division of Western Electric Co., has joined the Altec Companies as engineering manager. He will headquarter in Hollywood.

R. E. WARN, has been named manager of the newly-formed Hollywood division of Westrex Corp., which on Oct. 1 took over the motion picture activities of the ERPI division of Western Electric. WARN, associated

with the industry since 1928 when he joined ERPI, has served that company in Dallas, Kansas City, New York and Washington.

Managing director of Western Electric Co. of Australia, WARN was brought back in 1948 to become chief engineer of Westrex.

### Color Photography More Simple, Says Kodak Labs Director

The complexity of three-color photography for the user has decreased greatly in the past 20 years, according to Dr. Cyril J. Staud, director of Kodak Research Laboratories. "While it is not

possible to make three-color photographs with the simplicity of black-and-white pictures," said Dr. Staud, "definite progress has been made in making available a wide variety of materials and processes to fill the many desires for color photographs for a multitude of purposes."

The Kodak laboratory head said that so far all methods used to produce "wide hue-range" in color photographs, either as transparencies or prints, revolve about the use of three colors. He recalled that in 1861 Clerk Maxwell showed that a photograph in color could be produced through the use of three black-and-white

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positives placed in separate projection lanterns. In front of each lantern was a solution containing a colored liquid corresponding to the color filter through which the photographic material had originally been exposed.

This system, Dr. Staud said, was a good example of an "additive" process. It has been developed to yield results of very high quality. But additive color processes have always presented serious technical problems from the standpoint of wide use, he added.

#### Subtractive Process Simpler

Dr. Staud said that "subtractive" color processes, however, have relative simplicity from the standpoint of the user. In the subtractive system, a color print made by any of the current processes starts with a white area, and subtractive colors are used. In this system, white light from which blue has been taken yields yellow. White from which green has been taken gives magenta. When red light is removed from white light, it gives a blue-green called "cyan."

Because of their relative simplicity, Dr. Staud said, the subtractive processes "have expanded the color photographic horizon to include literally millions of people."

"This does not mean that subtractive



color photography is not complex. And, as far as I can see, no color processes will equal black-and-white photography in its simplicity of materials or processes. But the use of the materials in still and motion picture cameras now has the ease of black-and-white photography. Furthermore, because of their nature, color photographs are viewed much more critically than their black-and-white counterparts."

Dr. Staud also discussed a form of subtractive photography known as "inhibition color photography." This depends upon the formation of a gelatin relief image which can be dyed and from which dye can be transferred to another layer when the two are brought into contact.

He traced color development then to

the "one-shot camera" and three separate negatives from one exposure, to Technicolor three-color negatives, and to a new "multilayer stripping film" recently developed by Kodak.

#### Multilayer Stripping Film

This multilayer film is an experimental material which can be used in a standard motion picture camera and will yield three color-separation negatives. After exposure in the camera, the top, or blue-sensitive, layer is stripped off onto a piece of clear film support, carrying with it the yellow filter layer. After this has been done, the middle layer is stripped off onto a second piece of clear film support. The red-sensitive layer remains on the original film. The three films resulting from this stripping operation are then processed to yield three color-separation negatives.

Dr. Staud also discussed color coupler photography, in which certain types of developer solutions combine with other compounds called couplers to produce dyes. Color-coupler processes, he said, have greatly extended the range and use of color photography today. He gave details of modern color processes developed by several companies in this country and abroad, all of which are coupler processes.

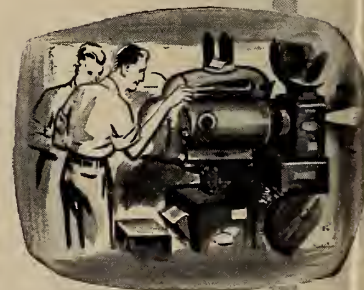
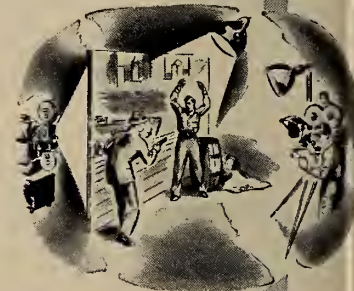
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## IN THE SPOTLIGHT

(Continued from page 19)

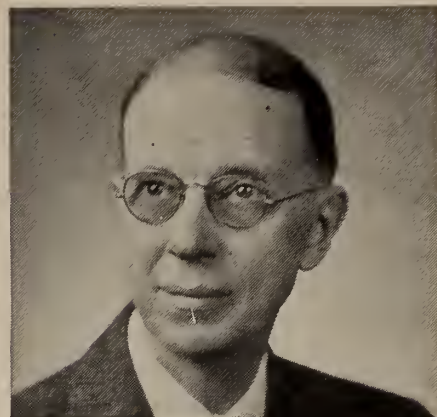
in Portland, Ore., resulted in new contracts calling for pay increases retroactive to April first last. Despite many obstacles, Steve Hazlewood, secretary, and Z. A. Sax, business representative, stuck to their guns and refused to call it quits until the contracts were signed, sealed, and delivered.

• We were quite taken back several weeks ago when we learned of the ambitions of James Petrillo, head of the AF of M (American Federation of Musicians) to include in his organization all film editors in the television field. Petrillo's claim to jurisdiction over film editors in the tele field is being hotly contested by John Lehnert, business representative of IA Film Editors Local 776, on the ground that all *film* editing, irrespective of its character, falls within the IA's jurisdiction. It seems to us that Petrillo's eyes perhaps are getting too big for his stomach. We shall see what we shall see.

• Harry Storin and Jack Winick, New York City Local 306, represented the Projectionists' Square Club at the recent

National Convention held in Atlanta, Ga. Jake Pries, Local 225 business representative, was host to the boys during their visit to Atlanta.

• Newly-elected officers for Film Post No. 1292, N. Y. City, are Tony Rugino, commander; Sam Wittenberg 1st vice-commander; Albert Sprung 2nd vice-commander; Joe Greece 3rd vice-commander; Frank Miller adjutant; Edgar Heidelberg finance officer and Archie Hollander hospitalization. All IA veterans are eligible for membership in Post 1292.



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## THE 35-MM PROJECTION POSITIVE FILM

(Continued from page 9)

in the camera reproduces light values positively instead of negatively.

Now, Reversal Negative developed in the ordinary way comes out as ordinary negative, and ordinary negative and positive films come out as reversal films when given reversal processing. But in this, as in other photographic matters, the best results are obtained only by selecting materials prepared expressly for the uses to which they are to be applied.

### Reversal Negative Prints

Reversal Negative is seldom used in professional motion picture work, but it is very popular with amateur movie-makers because it eliminates the expense of separate positive projection prints. However, the use of reversal films does not permit a very professional job of film

cutting with fades, wipes, lab-dissolves, etc.

Duplitzed Color Negative corresponds to Duplitzed Positive, but color prints on Duplitzed Positive are often made from two separate negatives exposed in a separation camera or run face-to-face in "hipack" in an ordinary camera fitted out with double magazines.

Monopack Color Negative, the same as Monopack Color Positive, is enjoying increasing use. This type of film has three emulsion layers on the same side

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of the film. The layers are dye-treated to respond to the three color groups perceived by the human eye—scarlet, green, and indigo. Upon reversal processing each emulsion layer is dye-toned to the color complementary to that to which it has been exposed. Thus:

- (1) Exposed to *indigo*, toned *yellow*.
- (2) Exposed to *green*, toned *magenta*.
- (3) Exposed to *scarlet*, toned *cyan*.

The yellow, magenta, and cyan super-

posed images *subtract* from the white light of the projector the proper amounts of scarlet, green, and indigo to form upon the screen the original scene in its natural colors.

"Direct" processing of Monopack Color Negative gives a negative of reversed values: black appearing as white, red as green, blue as orange, etc. Prints in true colors may be made from the negative.

[To be Continued]

## BOOK REVIEWS

TV PICTURE PROJECTION AND ENLARGEMENT, by Allen Lytel. 192 pages, profusely illustrated. John F. Rider, Publisher, 480 Canal St., New York. \$3.30.

Here is one of those rare volumes that are useful both to the neophyte and the experienced engineer. At first glance it appears to be a run-of-the-mill work on the fundamentals of the Tv art, which are appearing in all too great a profusion these days. As one progresses through this book, however, one's interest is progressively heightened, and it is amazing to learn in the process how easy it is to forget basic data of this sort as one goes on to more complicated equipment and technique.

### First Rate Job on Tv Optics

Of the six sections into which the book is divided, the first two deal with elementary optics, and it is these chapters which should exert the greatest appeal to one who seeks to understand the optical principles underlying Tv. The other four chapters show how these principles are applied commercially to Tv equipment by the various manufacturers,

in addition to comprehensive notes on the adjustment of the various receivers.

The volume benefits by a good job of indexing as well as a very useful bibliography. IP recommends this book unreservedly.

**SIMPLIFIED STEREOSCOPIC PHOTOGRAPHY**, by C. W. Wilman. Published by Marshall & Co., Ltd., London, England. 72 pages.

The novice stereoscopist should find this book valuable in gaining concepts of the fundamental basis of stereoscopic vision and photography and in applying them in making successful stereoscopic photographs. The author shows that perception of depth depends almost entirely upon the fact that near and distant objects appear in different relative positions when seen by the two eyes and that, therefore, satisfactory stereoscopic photographs can be made by simply taking two photographs, either simultaneously or consecutively, from two positions normally displaced 65 mm horizontally from each other.

Because of the fact that the camera lens



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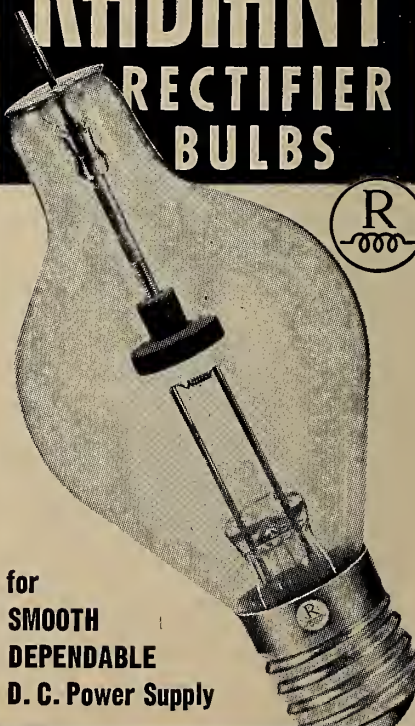
The carbons used cost about one-third that of the larger carbons employed in condenser-type lamps operating in the 140-180 ampere range.

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inverts the image, the right-hand and left-hand image of a stereoscopic pair must be transposed for proper viewing.

#### Various Taking Procedures Outlined

The various methods of taking stereoscopic photographs include: (1) the single-lens method, in which any ordinary camera can be used, the camera being shifted laterally 65 mm between consecutive exposures; (2) the use of lens-shifting devices, in which the lens and a suitable mask over the plate or film are shifted between consecutive exposures; (3) the twin-lens method, in which a camera is equipped with two lenses, 65 mm apart, with coupled shutters, diaphragms, and focusing devices, so that two photographs can be taken simultaneously on adjacent portions of a film or plate; and (4) the use of a prism attachment on some single-lens cameras, such as the Leica, which permits the taking of two photographs simultaneously in the area normally taken by one.

The necessity for *great depth of focus* in stereos is emphasized and the correct distance

on which to focus is given as the harmonic mean of the distances to the near and distant objects. A table is given for determining the distance of nearest and farthest objects in satisfactory stereos.

#### Requisites for a Satisfactory Viewer

A satisfactory viewer is one which holds the stereo pair with 65 mm between centers, has lenses which give a suitable magnification of the image, and has adjustments on focus and on the separation between the lenses to accommodate the interocular distance of different people. The advantages of cameras using plates, cut-sheet film and roll film are discussed. Any of the usual photographic materials may be used.

The author advises developing the negative to good contrast to avoid the appearance of Newton's rings in the print. Dirt and scratches should be carefully avoided. Various methods of transposition are described and it is emphasized that if transposition is accomplished by cutting either the negative or the positive, such defects as skewed horizons can be corrected.

Chapter 7 deals with large-scale problems in stereoscopy, such as difficulties in taking exposures of near objects, reduction of separation, rotation of a single-lens camera (about the subject as center instead of shifting the camera laterally as for normal stereoscopy), rotation of the subject (instead of the camera), rotation of twin-lens cameras, magnified images, etc.

Color films are particularly adapted to stereoscopy in that transparencies can be viewed as readily as paper prints and give results superior to those of paper prints. Suggestions are given regarding exposure, spotting, and the quality and type of illumination for viewing. One chapter treats such items as stereoscopic line drawings, exaggerated relief, enlargements, aerial-survey work, stereoscopy in astronomy, the pseudoscope, anaglyphs, and stereoscopic projection by polarized light.—EASTMAN KODAK Co. ABSTRACT.

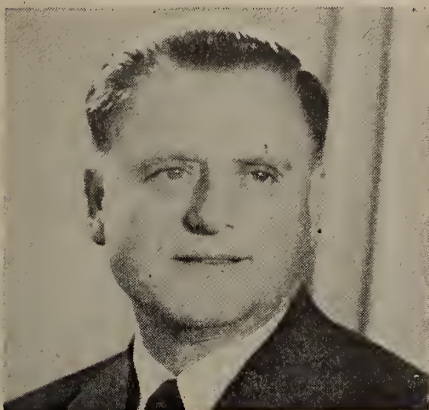
ELEMENTS OF SOUND RECORDING, by John G. Frayne and Halley Wolfe. 674 pages, 6 x 9 1/4 inches, index, 480 illustrations. John Wiley & Sons, New York. \$8.50.

This is the best straightaway exposition of the art of sound recording that we have ever

seen. And well it might be, because the authors have attained world-wide recognition as masters of this art, both in their theoretical approach and in the practical application of the principles enunciated herein. The content of this book belongs peculiarly to the restricted field of sound recording and reproducing—film, disc, and magnetic tape—being of an order that is not found in books devoted to the allied fields of electronics, radio engineering, etc.

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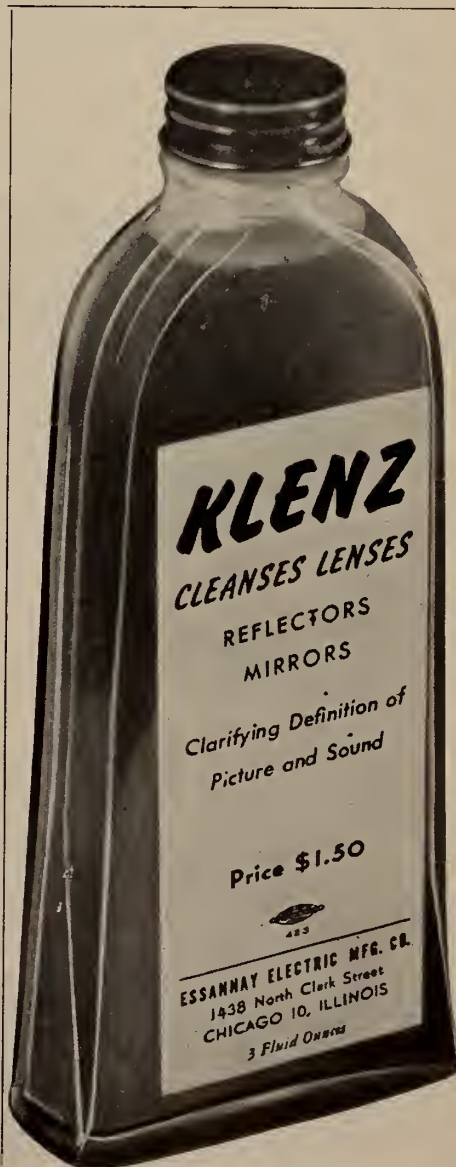
Nobody who is seriously interested in sound recording and reproduction can afford to be without this volume. It is absolute tops and bids fair to maintain that position for years to come. It's a swell publishing job, too: paper, type, binding and, most important, the scale and clearness of the illustrations, contributing greatly to its overall worth.



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## THEATRE TELEVISION: WHAT, HOW AND WHEN

(Continued from page 15)

transmission facilities, or it may be carried out as a common enterprise by several theatres in a city sharing certain facilities and co-operating together. Such a co-operative group is described hereafter. Since the capital and operating expenses of any Tv enterprise are substantial, it is assumed that some or all the theatres in a city will form a co-operative group, and that this organization will be predominant in the theatre Tv industry. The present discussion, therefore, is limited to a description of theatre Tv in cities where it will be promoted and carried on by one or more co-operative groups.

Theatre Tv envisioning co-operative action by several theatres in a single city, needs Tv transmission facilities for five purposes:

### Five-Fold Transmission Facilities

1. For distribution of programs from a central distributing point to groups of theatres. Such facilities may be described as "Multiple-Addressee Systems."
2. For transmission of programs from

studios and regular origination points to the central distributing point. In broadcasting terminology, such fixed circuits are termed "Studio-Transmitter Links."

3. For mobile remote pickup of programs and transmission to the central distributing point. In broadcasting terminology, these mobile units are known as "remote pickups" and are used for the origination of programs such as sports events, parades, news events, and stage shows.
4. For transmission of programs to intercity relay points. These fixed circuits also may be classified as "Studio-Transmitter Links."
5. For intercity relay of programs.

### Typical Theatre Tv Hook-up

The use of transmission facilities by such co-operative groups is most easily explained by reference to Fig. 1, which is a diagram of a typical theatre Tv system in two imaginary cities, A and B. City A is assumed to be located on the A.T.&T. coaxial cable, and City B is assumed to be located off the coaxial cable about 35 miles east of City A. City A contains 25 motion picture theatres which are part of the co-operative Tv group and receive programs from it.

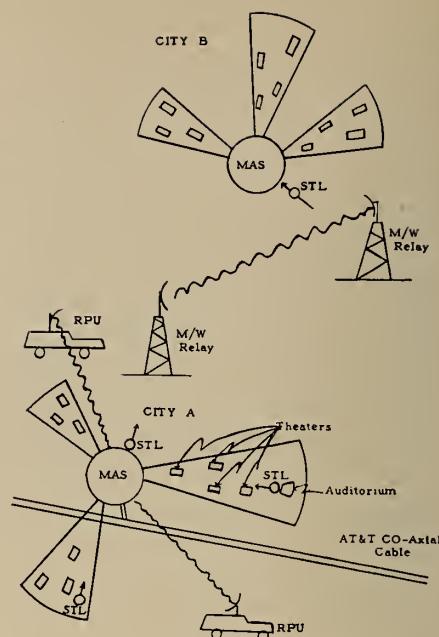


FIGURE 1

Typical two-city television relay system.

City B contains 15 such Tv theatres.

In each city the key point of the system is the central distributing point where the multiple-addressee system is located (marked on the diagram "MAS"). The co-operative group in City A maintains studio-transmitter links (STL) from one studio or theatre which produces a daily stage show, and from the Municipal Auditorium. It also utilizes two mobile remote pickup units which are available for use in appropriate scenes of action throughout the area. It contains a microwave relay transmitter

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(M/W Relay) which is used to transmit programs to City B on a one-way circuit. In City A a studio-transmitter link (STL) connects the main distributing point with the intercity relay.

The co-operative group in City B, running a "barebones" operation and depending on City A and the theatre network for substantially all programs, requires fewer transmission facilities. It must maintain a multiple-addressee system (MAS) at the central distributing point, a microwave relay receiver (M/W Relay), and a studio-transmitter link (STL) to connect the two points. It requires no other transmission facilities.

### Capital Costs of Installation

What investment will be required to install the theatre Tv systems described, in the two cities? The price of the installation required is approximately \$25,000 per theatre, regardless of whether the direct-projection or the intermediate-film system is used. The following discussion endeavors to fix estimated costs of the equipment required by the co-operative group of City A.

1. *Multiple-Addressee System* — The basic elements of this system are a transmitter, associated control and power equipment, film-recording and film-

camera equipment, and a multi-beam, highly directional, antenna array. If live programs are to be produced locally, studio video camera equipment and studios with proper lighting must be provided.

Programs would be beamed in the necessary directions to permit reception by each of the theatres equipped to receive the transmissions. Three such directional beams are pictured in Fig. 1 at City A. In the frequencies involved, a low-power video transmitter would provide satisfactory signals to cover the area in which the associated theatres were located.

While no such multiple-addressee Tv system is in operation in this country, the engineering principles underlying it are not new, and there is no doubt that it could be designed and manufactured within a reasonably short period after order.

With the exception of the directive antenna, the other equipment would be adapted readily from Tv broadcast equipment now in use. The directive antenna presents no exceptionally difficult problems, although it would have to be engineered on a custom basis to fit the problems of the particular city involved, with the location of theatres in view.

The capital cost of such a system, without studio-camera equipment and studios, is estimated at approximately \$175,000. This includes \$25,000 for the acquisition of instantaneous film-recording equipment, and \$50,000 as the cost

of the directive-antenna array. With studio-camera equipment and studios, about \$100,000 would be added to the cost. These estimates do not include expenditures for acquisition or remodeling of buildings or land.

2. *Studio-Transmitter Links* — The necessary facilities to connect studios or program origination points with the cen-



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tral distributing point would be substantially the same as the equipment used by Tv broadcast stations to link studio and transmitter. These connections may be made by microwave relay, coaxial cable, or by balanced telephone wires over distances from one or two miles.

If studio-transmitter radio links are deemed desirable, their cost would be approximately \$15,000 per installation. If coaxial cable or television wires are used, the telephone company will provide the service at regular rates, and capital costs to the theatre Tv system will be nominal.

3. *Remote Pickups*—The two remote pickup units contemplated for City A would cost approximately \$50,000 per unit. This includes two portable camera units, audio equipment, a small truck, and the video-link equipment. The audio link is a telephone circuit. The video relay may be used over distances of from 10 to 15 miles, but only over line-of-sight in the high frequencies used. This equipment may be owned and operated, or may be leased from the telephone company, or, perhaps, from local Tv broadcast stations.

4. *Intercity Relays*—The one-way intercity relay circuit from City A to City B, contemplated in Fig. 1, is estimated to cost from \$25,000 to \$50,000. This figure includes both the transmitting and receiving units.

As described previously, the relay transmitter in City A and the relay receiver in City B would be connected

with the central distributing point in each city by studio-transmitter links, costing approximately \$15,000 each. However, given an appropriate location of the relay units, coaxial-cable connections might be provided by the telephone company.

On the aforementioned basis, a rough estimate of the capital investment required by the co-operative theatre group in City A would total approximately \$445,000, consisting of (1) multiple-addressee system and associated equipment including studio equipment \$275,000 (2) three studio-transmitter links, \$45,000 (3) two remote pickup units, \$100,000, and (4) 50 per cent of the cost of the intercity relay installation, \$25,000.

The capital investment required in City B would be substantially less. The cost of the multiple-addressee system, eliminating \$100,000 as the cost of items of studio equipment and studios that full-scale program production would require, would come to \$175,000 or less.

If an intermediate-film recording unit were not used in City B, this cost would be reduced by another \$25,000. The studio-transmitter link and intercity relay receiver installations would add approximately \$40,000. Thus, the total investment at City B would approximate from \$190,000 to \$215,000.

[Note: Subsequent installments of this series will discuss transmission facilities for theatre Tv, color Tv, and programming.—Ed.]

## STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946.

Of INTERNATIONAL PROJECTIONIST, published monthly at New York, N. Y., for October 1, 1949.

State of New York }  
County of New York } ss.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared R. A. Entracht, who, having been duly sworn according to law, deposes and says that she is the Business Manager of INTERNATIONAL PROJECTIONIST and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation, etc.) of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

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Editor, Henry B. Sellwood, 19 West 44 Street, New York 18, N. Y.

Managing Editor, R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

Business Manager, R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

2. That the owner is:  
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R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by her.

R. A. Entracht, Business Manager

Sworn to and subscribed before me this 26th day of September, 1949.

(Seal) BERNARD SCHWARZ

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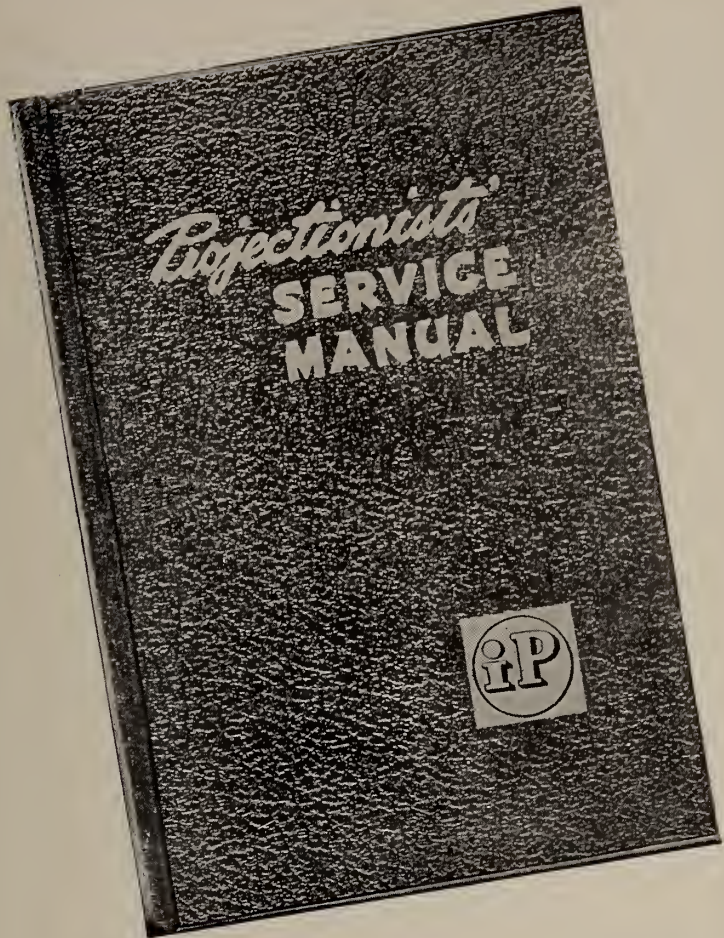
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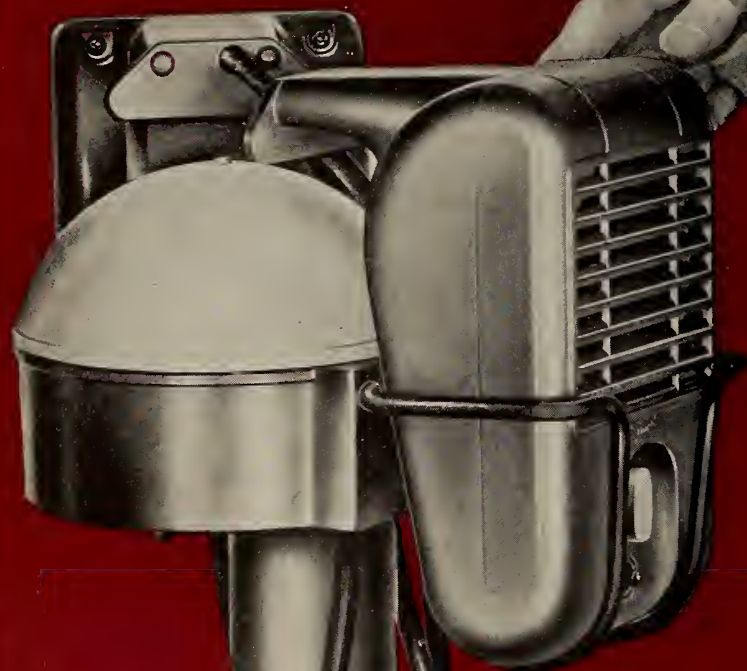
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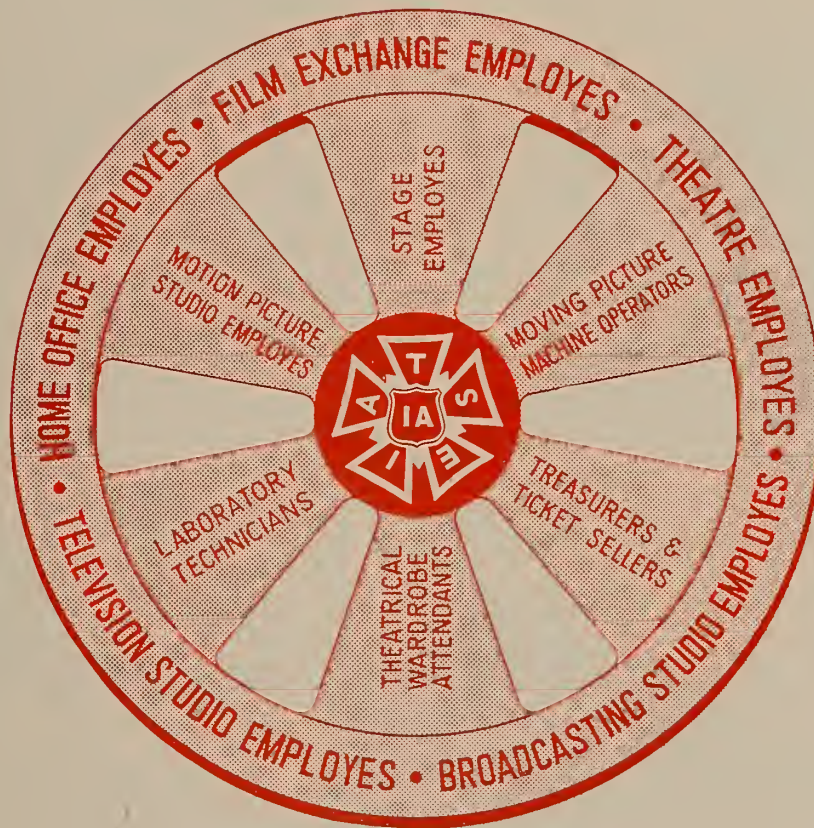
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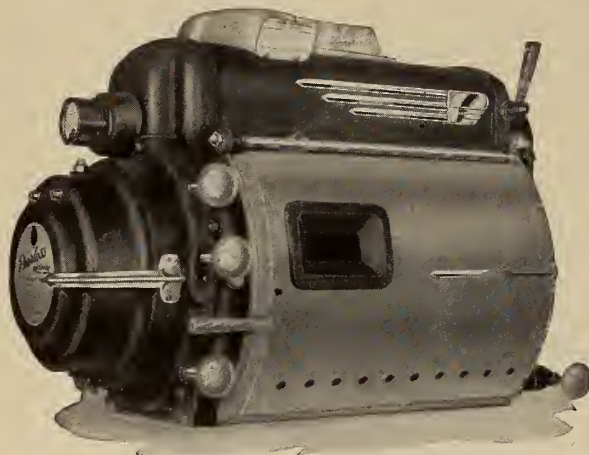
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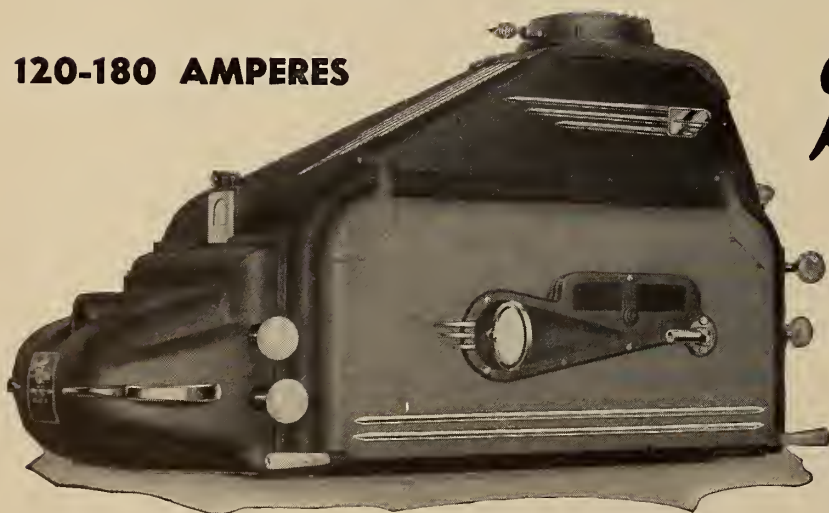


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HENRY B. SELLWOOD, *Editor*

Volume 24

DECEMBER 1949

Number 12

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## MONTHLY CHAT

THAT projection is not a static art is readily apparent to anyone who reflects but a moment on the many extensive advances in equipment racked up by enterprising manufacturers during the past couple of years, with even more notable improvements slated for the immediate future. The non-technical people in the industry are all too prone at times to scoff at the designation of projection as an "art," their view being that it is purely a mechanical process which involves merely the throwing of a switch or the pressing of a button.

We regret that these scoffers can't spend just one day, an average tour of duty, in a modern projection room which is outfitted with the latest equipment. They would quickly find out—and would undoubtedly be startled by their discovery—that arc lamps burning super high-intensity carbons and pulling currents ranging up to 180 amperes are not exactly the type of toy one would give to a child with which to play.

Probably the best job over-all was done by the manufacturers of arc lamps and carbons who, working smoothly together, really went to town on these units. The carbon people state flatly that the only limitation to carbon trims which would pull 350 amperes is the lamphouse itself. This is no reflection on the lamp manufacturers, who have had to lick some formidable problems to produce the present lamps.

And just consider the fine job done by the lens manufacturers over the past several years. In this very issue is the announcement of a new series of long focal length lenses which should effect a tremendous improvement in screen illumination in drive-ins and in the larger theaters.

Nor have the projector manufacturers been idle. IP is aware of several projector developments of far-reaching significance, but it is not privileged to reveal the facts at this time. In the very near future, however, the wraps will be off these advances.

On the whole, the manufacturers of projection equipment have nothing to excuse or to gloss over. They've done a bang-up job over the past few years; and it is to be regretted that those same people who deride projection as a wholly mechanical process, do not display the same degree of initiative shown in the design and production of much fine equipment by spending a small portion of their box-office take to replace their old, outmoded—"obsolete" is the more accurate term—units which can't possibly give a good screen image.

Static, indeed. The projection field could lend more than a bit of its own dynamism with which to impregnate a few undersides in exhibitor ranks.



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# The 35-mm Projection Positive Film

By ROBERT A. MITCHELL

## II. The Manufacture of Film

THE photographic films which provide an almost limitless world of entertainment for the patrons of the 90,000 motion picture theaters of the world represent a magical combination of diverse products. Fluffy white cotton, glittering ingots of silver, carboys of fuming acids, gelatine from the slaughterhouse, bromine from alkali brines, and a host of materials created by modern chemical wizardry undergo a miraculous transformation in the factories of Eastman Kodak, Du Pont, *et al.*, and eventually emerge in the form of plastic ribbons 35 millimeters (1.378 inches) in width, coated with light-sensitive emulsions and perforated along the edges.

The manufacture of film involves five distinct processes, or operations, namely:

1. Preparation of the film-base plastic.
2. "Casting" the film base.
3. Preparation of photographic emulsion.
4. Coating the base with emulsion.
5. Slitting the sensitized film into 35-mm ribbons and perforating them.

Both nitrate and acetate film base are *cellulose plastics*. Cellulose is a compound familiar to everyone. This page consists largely of cellulose. Wood is also an impure form of the substance. *Cotton is almost pure cellulose*. Only the very purest commercially available form of cellulose—cotton—will do for film base. And as pure as cotton is, the manufactur-

ers of film subject it to exhaustive physical and chemical purifying treatments before using it.

### Esterification Reactions

The purified cotton is "nitrated" to make nitrate film, or "acetylated" to make safety film. These chemical processes are called *esterification reactions* because the nitrated and acetylated products formed by them are "esters" of cellulose.

The *nitration* of cellulose involves a



At Kodak Park, motion picture film is slit to the proper widths on machines like this.

chemical reaction between cotton and nitric acid. These two substances exchange certain groups of atoms which they contain: the cellulose gives nitric acid "hydroxyl" groups in return for "nitrate" groups from the acid. This molecular activity transforms the cellulose into nitrocellulose, the chief ingredient of nitrate film base, and the nitric acid into water.

The formation of water in this reaction is undesirable, however, because it tends to stop the nitration of the cotton. The chemist hurdles this difficulty by adding strong sulfuric acid to the nitric acid. Sulfuric acid combines with the water as rapidly as it is produced to form hydrates, and this makes it possible for the exchange of hydroxyl and nitrate groups to continue until the cotton is nitrated to the desired degree.

The nitrated cotton used in film base is a mixture of the lower nitrocelluloses—chiefly cellulose tetranitrate. Guncotton, a mixture of the higher cellulose nitrates, would result from continued nitration.

Although the general principle of *acetylation* is the same as that of nitration, it is somewhat more complicated in both theory and practice. Instead of the nitric-sulfuric acid mixture, special reactants derived from acetic acid or acetic anhydride are employed. Moreover, the acetylating reaction must be followed by "hydrolysis" to reduce the rather high degree of acetylation of the cotton to the degree required in the final product.

A very highly acetylated cellulose has

desirable characteristics—toughness, flexibility, resistance to heat and moisture, etc., but unfortunately there are no suitable solvents in which to dissolve it for the film-casting process. A reduction in the number of acetate groups of atoms attached to the cellulose molecule is the purpose of the hydrolysis reaction.

The older safety-film bases were usually made from cellulose diacetate, a substance very soluble in a number of organic solvents. But in comparison with nitrate film, the diacetate film had poor wearing quality and an excessive tendency to swell when wet and to become brittle when dry.

The new and superior cellulose triacetate used for high-acetyl safety film is prepared by carrying the hydrolysis only a fraction of the amount employed in the manufacture of the diacetate. Cellulose triacetate shares to some extent the desirable qualities of the higher acetates, yet it is sufficiently soluble in certain organic solvents to be made into film.

### Preparation of Film Base

The purified and dried nitrocellulose or cellulose acetate is dissolved in volatile solvents to make a syrupy "dope" suitable for the film-casting process. Solvents used to dissolve nitrocellulose include various mixtures of diethyl ether, methyl alcohol, ethyl alcohol, isoamyl alcohol, acetone, methylethyl ketone, isoamyl acetate, ethyl acetate, butyl acetate, and various "Cellosolves," of which 1-ethoxyethan-2-ol is representative.

The solvent mixtures for cellulose triacetate usually contain considerable proportions of dioxane.

Various materials which improve the flexibility, toughness, and wearing quality of the finished film are incorporated

One of many gigantic machines at Eastman's Kodak Park which convert the honeylike substance known as "dope" into endless sheets of the familiar transparent film base. The material is so clear as to be nearly invisible as it passes through the machine.



# INTERNATIONAL PROJECTIONIST

extends to all its friends

the

## Season's Greetings

into the dope before casting. These film-improving materials, called *plasticizers*, include such substances as camphor, castor oil, ethyl phthalate, butyl phthalate, and tricresyl phosphate. Plasticizers are used in both nitrate and high-acetyl acetate film.

By film "casting" is meant the operation of spreading out the honeylike dope on a polished surface in order to expel the volatile solvents and obtain a thin pellicle (film) of cellulose plastic-cellulose ester mixed with plasticizers.

The film-casting machine is a large and complex apparatus. All air admitted to the film-casting room is washed free of dust and conditioned as to temperature and humidity; and the machine, itself, is kept scrupulously clean.

The heart of the film-casting machine is a metal drum which, in some installations, is 20 or more feet in diameter. (An endless metal belt is sometimes used in place of the drum.) The outer rim of the drum is several feet in width and very highly polished.

### Application of 'Dope'

Dope is applied to the rim of the slowly revolving drum by means of a special spreading arrangement which allows the thickness of the film to be controlled. The speed at which the drum revolves is such that the greater part of the volatile solvents evaporates from the film of dope before one complete revolution has been made. An aspirating ventilator placed over the rim of the drum hastens solvent evaporation.

The coagulated film of nitrate or acetate base is continuously detached from the drum and drawn away by a separate roller. The film, several feet in width, is so transparent as to be nearly invisible as it passes through the remainder of the film-casting machine.

Various other rollers complete the drying operation, and the film is finally wound up to await the emulsion-coating process.

The pale yellow light-sensitive coating

applied to one side of the transparent film base (to both sides in the case of duplitzed stock) is called the *emulsion*. The term "emulsion" signifies a suspension of minute particles of one substance in another, the two substances being immiscible, or insoluble, in one another.

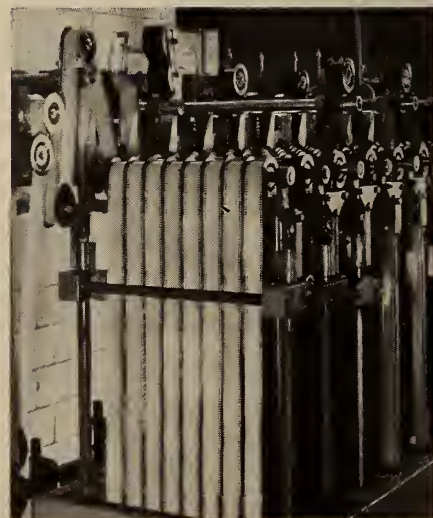
### Preparation of Emulsion

An emulsion is not a true solution. Kerosene, for instance, is immiscible with water. But if a little kerosene is added to water and the mixture shaken very vigorously, a milky fluid is obtained. The whitish mixture is an emulsion of kerosene droplets suspended in water.

An emulsion of kerosene and water breaks down very quickly, the two liquids separating, *unless an emulsifier is added*. Soap acts as an emulsifying agent for kerosene in water; so if a small piece of soap is shaken up with the two immiscible liquids, a milky-white suspension is obtained which lasts a long time.

The same phenomena are observed in the case of liquids and solids which are insoluble in them. The chief light-sensitive ingredient of photographic emulsions

35-mm processing machine at Kodak Park





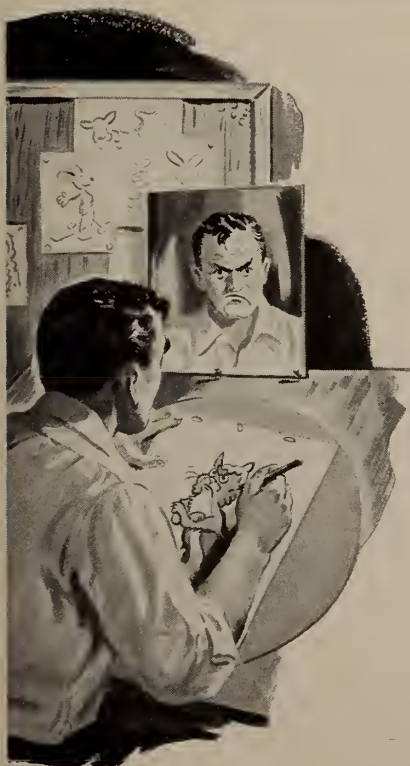
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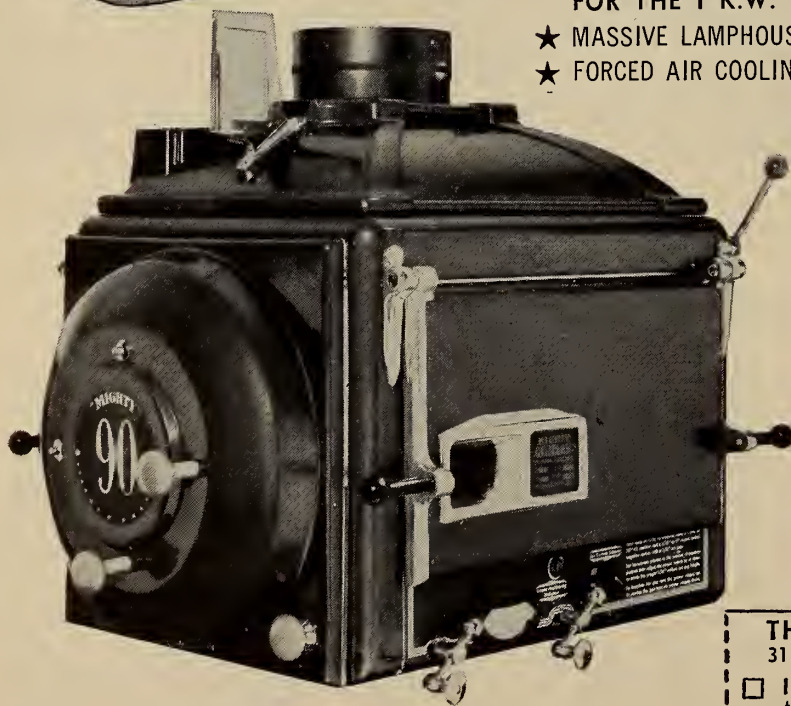
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is *silver bromide*, an insoluble yellowish powder. It is clearly impossible to apply a *solution* of silver bromide to gelatine-coated film base, because silver bromide is insoluble in water. An *emulsion* of this compound must therefore be prepared for the film-coating operation. Now, gelatine is used as the emulsifier for emulsions of silver bromide in water.

Gelatine is a curious substance. When dry it is hard and glassy. Purified powdered gelatine is used in commercial ice cream and for making Jello desserts. Impure gelatine is employed as glue and sizing.

When placed in cold water, gelatine swells. The emulsion of film which has been sprinkled with water becomes reticulated, or spotted, because the swollen gelatine, upon drying and shrinking, causes the embedded silver particles to shift their positions. When added to warm water, gelatine dissolves to form solutions which are viscous and sticky. There is no definite limit to the solubility of gelatine: the more gelatine added, the thicker the solution becomes. And whenever such a solution of gelatine cools, it sets to a jelly.

Soap, a "protective colloid" for kerosene and water mixtures, acts somewhat like gelatine in this respect; but of the two, gelatine is by far the more effective emulsifying agent.

The silver bromide for photographic emulsions is made from silver nitrate and potassium bromide by chemical interaction. The silver nitrate is obtained in the form of colorless platelike crystals by dissolving silver in nitric acid.

Both silver nitrate and potassium bromide are salts which dissolve very readily in water to form clear, colorless solutions. When solutions of these two salts are mixed, yellow silver bromide is instantly formed and, being insoluble, precipitates to the bottom as a fine sludge.

If gelatine is added to one or both of the salt solutions before mixing them together, the silver bromide formed will not settle out, but remains suspended in the liquid as a creamy emulsion.

Silver bromide is very sensitive to light, so as to avoid spoiling the emulsion during its manufacture, the two gelatine-containing salt solutions are mixed in the dark (or under a dim red safelight). In certain cases a small part of the potassium bromide is replaced by potassium iodide. This salt reacts with silver nitrate to form silver iodide, a compound similar to silver bromide.

Silver bromide is insensitive to red and orange light, and it reacts only feebly to yellow light. The color response of this photo-sensitive compound may be extended by incorporating special dyes into the emulsion. By virtue of an energy-transfer process not yet perfectly understood, certain dyes sensitize the silver bromide to those colors which they them-

selves absorb.

The pink dyes used for orthochromatic negative emulsions absorb yellowish green light, and hence make the emulsion sensitive to yellow and green in addition to blue, violet, and ultraviolet. Likewise, the green dyes used for panchromatic emulsions absorb red, thereby extending the sensitivity of silver bromide into the red region.

The light-sensitivity, or *photographic speed*, of an emulsion may be increased by subjecting it to heat during its manufacture. The most rapid emulsions are heated to higher temperatures and for longer periods than slower emulsions.

### Coating and Final Stages

The coating of film base with emulsion is carried out on film-coating machines. The base is first coated with a substratum of clear gelatine to insure perfect adherence and uniform thickness of the emulsion layer. The coating of positive and orthochromatic emulsions on the gelatine-coated film base may be done under red light, and the slower panchromatic emulsions under very faint green light. In the case of the more sensitive emulsions, however, total darkness is necessary to prevent "fogging" the film.

Anti-halation coatings on the "blank" side of negative film are also supplied by film-coating machines. These coatings (which consist only of colored gelatin, and are not emulsions) serve to reduce the glare spots which blur the images of bright objects in a picture. Without such a coating, the brighter rays of light impinging upon the film pass through the emulsion to the uncoated side of the base and are reflected back to the emulsion as a confused jumble of images.

An anti-halation coating absorbs most of the light passing through to the back of the film, thereby reducing reflections to a minimum. The soluble dyes employed wash out of the gelatine backing when the film is developed.

The film-coating machines work on the same principle as the film-casting machines. Coating rollers transfer the warm, liquified emulsion to the surface of the film base. The coated film, several feet in width, passes through drying chambers

where the emulsion layer is congealed. The film is automatically wound in large rolls at the end of the machine.

The wide film taken from the film-coating machine is cut lengthwise into ribbons 35 millimeters in width by film-slitting machines.

In the early days of the movies large quantities of unperforated 35-mm raw stock were supplied, the sprocket holes being punched out more or less perfectly by machines belonging to the studios and processing laboratories. Today, however, all the film used in professional motion picture work is perforated by the manufacturer of the film, a job requiring precision apparatus continually maintained in first-class condition by frequent inspection and servicing.

Before the film is packed in rolls for shipment to the retailers, it is fed through machines which light-print the manufacturer's name and other identification markings in the sprocket-hole margins.

[To be Continued]

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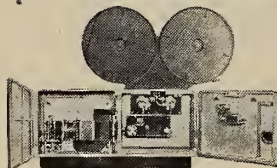
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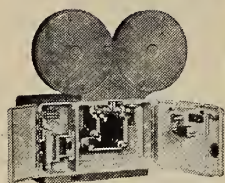


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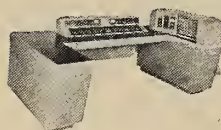
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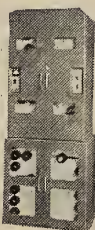
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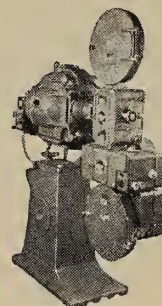
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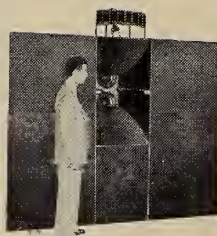
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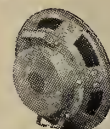
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HIGH FREQUENCY  
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FULL RANGE SPEAKER



HIGH FREQUENCY HORN

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# Westrex Corporation

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FORMERLY WESTERN ELECTRIC EXPORT CORPORATION

## The Garutso 'Balanced' (25-75 mm) Photographic Lenses

IP is in receipt of a communication from E. Goulden, Inc.,\* exclusive agent for Garutso "Balanced Lenses," which, credited by their sponsor with the ability to impart depth to photographic images, have received widespread and, on the whole, rather glowing sendoffs from the photographic trade press. The virtues of these patented lenses are described in the appended verbatim copy of a statement by their sponsor:

"A commercial set of Garutso lenses is comprised of 25, 30, 35, 40, 50, and 75 mm focal lengths. Inherent to all of them are unusual characteristics that set them far apart from conventional lenses of similar focal lengths.

### 'Variable Deep Field of Focus'

"First, instead of a *single plane* of focus, Garutso lenses have a variable and tremendously deep *field* of focus. This depth of field results from Mr. Garutso's discovery of new principles and is in no wise produced by special diaphragm apertures or tricks of any kind. The variability of the field is controlled by focus adjustment entirely.

"A number of different Garutso lens formulae have been developed for the modification of conventional photographic objectives of different types and focal lengths. While these formulae differ among themselves, they

all embody the same optical balance principles.

### Cite Two Major Improvements

"In general, the Garutso modification accomplishes two major improvements: (1) the focal depth of the modified objective is increased, and (2) the definition and contrast of the image is greatly enhanced by a substantial reduction in the vestigial spherical aberration of the conventional lens.

"Previous attempts to accomplish the increase in depth of focus, first above-mentioned, have had no success because the modifying elements used have introduced other undesirable aberrations.

"The diaphragm, instead of being used to create an illusion of increased focal depth by means of small apertures as in conventional lens, is employed in the Garutso lens to increase the plasticity of the photograph, thereby intensifying the three-dimensional effect.

"The Garutso balanced lens provides a negative of uniform density throughout the entire field at all apertures."

Following careful consideration of the foregoing, as well as of other data relating to the Garutso lens, IP is constrained to make the following observations:

For a given sharpness of image at a given focal length of the lens and a given aperture, *all* lenses have and *always will* have a given depth of focus.

There are three methods by which one may achieve depth of focus: (1) reduce the focal length of the lens; (2) diminish the size of the aperture, and (3) reduce the sharpness of the image. This last-named condition would seem to be a major function of the Garutso lens, with results that were strikingly apparent in the motion picture "Citizen Kane," produced by Orson Welles some years ago.

The foregoing is as much a natural law as is the fact that if one stepped out of a ten-story window the chances would be excellent that one would break his neck. We need not confuse this issue with considerations of aperture opening, lens speed, or the amount of light on a given set. These fundamental laws prevail and are at once controlling and incontrovertible—even in Hollywood.

It is an astonishing thing that nobody in Hollywood has yet lent acceptance to the principle that we shall reduce the sharpness of the *foreground* images.

### TESMA's New Headquarters

The home office of TESMA (Theater Equipment Supply Manufacturers Assoc.) is now located at 1938 Hillhurst Ave., Hollywood 27, Calif. The phone number is NOrmandy 7747. The engaging secretary of the Association, Roy Boomer, is rendering the same fine service as of yore.

# INTERNATIONAL PROJECTOR CORPORATION

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and a Prosperous 1950*

"SIMPLEX Projectors and Sound Systems"

FIG. 1. Screen light with 13.6-mm super high-intensity carbons vs. burning rates—no film or shutter.

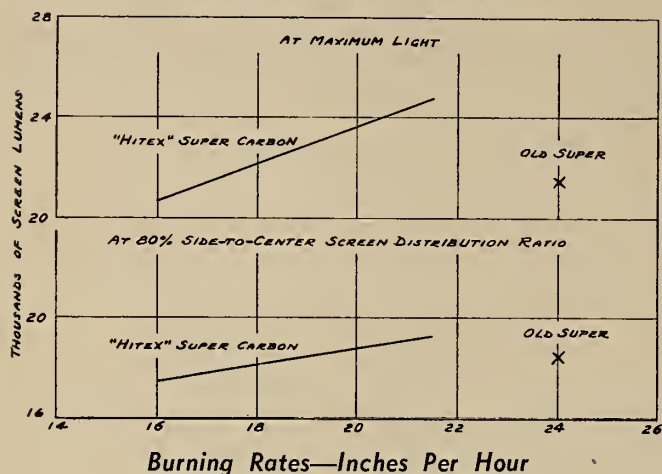
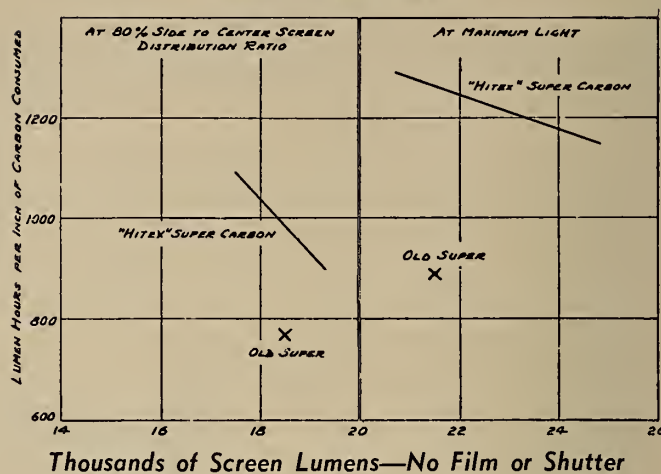


FIG. 2. Efficiency of conversion of carbon into light energy vs. the amount of light produced.



## The New 13.6-mm National Hitex Super High-Intensity Carbon

RECENT years have witnessed an ever-increasing demand for higher levels of light for motion picture screens, and this demand is by no means limited to the huge screens utilized for drive-in theaters. On the contrary, exhibitors everywhere—large theaters and small—evidence a growing awareness of the dividends in patron satisfaction which accrue as the result of a well-lighted screen image.

Concerted action by both carbon companies and arc lamp manufacturers has resulted in a sharp revision upward in the amount of screen light available for all types of theater operations. The latest contribution to this advance in the art is National Carbon Co.'s new 13.6-mm "Hitex" carbon, designated as a super high-intensity and having a rating of from 170 to 180 amperes.

Distribution of these Hitex super carbons is as yet on a very restricted basis, since only a limited number of them is being produced.

### Comparison With Old Super

A true measure of the efficiency of the Hitex super carbon may be had only by comparison with former "super" high-intensity 13.6-mm types. The first of these, produced by National in 1936, had a peak operating rating of 180 amperes and constituted a great improvement in both quantity and distribution of light over other carbons then available.

Convincing evidence of the effect of continuing research and improved meth-

ods of manufacturing lies in the fact that only five years later, in 1941, an improved super high-intensity was introduced by National which, rated at 170 amperes, produced 20% more light than did the 1936 type, this with a 10-ampere reduction and no increase in burning rate!

Compared with the old super-high intensity carbon (1941), this new Hitex carbon gives a higher light output of better quality (whiter); longer life, and greater efficiency in terms of converting carbon into light energy—all without any measurable increase in total energy (heat) at the aperture.

### 'Hitex' Operating Characteristics

Operating characteristics of the Hitex carbon are given in Table A. These data represent measurements made on a typical condenser system and provide a direct comparison of performance with the old super carbon under the conditions described.

It will be noted that at the low end of its rated amperage the Hitex carbon approximately matches the amount of light produced by the old super; while at its peak current rating the Hitex delivers approximately 15% more measurable light than the old super.

The light output of any carbon arc projection setup depends upon a number of variable factors, one of the most important of which is the distribution ratio of light over the entire screen surface, that is, from the center to either side. At

80% center-to-sides distribution ratio (considered a very efficient distribution) the light output of the old super is midway of the output of the Hitex carbon at its low and high ends of rated operating current.

Thus, if the Hitex carbon be operated at its lowest current rating, its light output will fall just short of that of the old super; but at its highest rated operating current it will give above 15% more light than does the old super.

### Economy of Operation

How much light output may be had at what cost is a vital question for every type of theater operation. The answer may be arrived at by plotting the screen light against the burning rate of the carbon in inches per hour, thus permitting a determination of just how much light is obtained at various burning rates and at what cost per hour. Such data is given in Fig. 1, which includes the data shown in Table A.

It will be noted in Fig. 1 that the data given for both the Hitex and the old super carbons cover different burning rate ranges, but this does not obscure the fact that the Hitex is by far the more economical of the two—that, in fact, the Hitex carbon has a longer life by a margin of from 30 to 40%.

Reduced to practical operating terms, these figures mean that at 170 amperes each Hitex carbon will project three double reels of film, as contrasted with the two double reels projected by the old

super—an extension of 50% in burning time at this amperage. At the high end of its rated current, 180 amperes, the Hitex will project two double reels and one “short” reel.

As is well known, increased light with a given projection setup means higher amperage and a faster burning rate for the carbon, as is plainly indicated in both Table 1 and Fig. 1. The light output of a given carbon divided by its burning rate indicates the total amount of light energy produced per inch of carbon burned and measures the degree of efficiency of conversion of the carbon into light energy.

### Much Higher Conversion Rate

This efficiency of conversion is shown in Fig. 2, wherein the lumen-hours per inch of carbon are plotted against the correlative value of screen lumens produced. It will be seen that the use of higher currents with a resultant increase in light with a given carbon effects some decrease in efficiency. In terms of efficiency, it is obvious from Fig. 2 that for the production of the same amount of light the Hitex carbon is from 30 to 50% more efficient than the old super.

Electrical power consumption for the operation of a carbon arc is proportional to the arc current pulled by the arc from either a local, constant-voltage d-c generator or direct from the power company's d-c line. The degree of efficiency with which power is converted into light is expressed in lumens-per-ampere, which is the amount of light produced divided by the arc current.

These data are set forth in Fig. 3 in which the degree of efficiency is plotted against the amount of light produced at a given current. Evident is the increase in efficiency of conversion of power into light as the current and the amount of light produced are boosted. Equally evident is the fact that at the same light levels the Hitex carbon matches the old

TABLE A. Characteristics of 13.6-mm old and new National super high-intensity projector carbons under typical operating conditions.

	Old Super	New 'Hitex' Super	
Arc Amperes	170	170	180
Arc Volts	75	70	74
Positive Consumption Rate (inches per hour)	24.0	16.0	21.5
Screen Lumens at Maximum Light*	21,500	20,700	24,800
Side-to-Center Screen Distribution Ratio at Maximum Light	65	60	60
Screen Lumens at 80% Screen Distribution**	18,500	17,500	19,300

\* Screen lumens with no projector shutter, film or filters; condensers at F:2.0 adjusted for maximum light.

\*\* Same, except that condensers are adjusted for 80% side-to-center screen light distribution ratio.

super carbon in power conversion efficiency—an important point when the other advantages of the Hitex carbon are considered.

### Spectral Characteristics

Color temperature is an important factor in the performance of any carbon, since this is the governing factor in the quality of the light projected on the screen.\* Fig. 4 is a spectral energy distribution curve for both the Hitex and the old super carbons at maximum light at the center of the screen, with both arcs pulling 170 amperes and no film being projected. The color temperature figures are 5925° for the old super, and 6250° for the Hitex carbon, with the latter having the appearance of a whiter light.

As indicated previously, the Hitex carbon gives approximately 15% more measurable light per unit of heat at the aper-

ture than does the old super. On this account, the Hitex carbon burned at 180 amperes does not give more total energy at the aperture than does the old super. This means that the Hitex carbon will enable a great increase in light without in any way aggravating the problem of heat on the film.

Recommended for use with the Hitex carbon over its entire current rating is the National Orotip 1/2-inch heavy-duty negative carbon.

The old super 13.6-mm carbon gave best results when the negative was approximately centered on the positive crater face. With the Hitex carbon, optimum stability, light output and burning rate are obtained when the negative is positioned a bit lower so that it centers on the positive crater face.

The terms “Hitex,” “National” and “Orotip” are registered trade-marks of National Carbon Company, Inc.

FIG. 3. Efficiency of conversion of electrical power into light vs. amount of light produced.

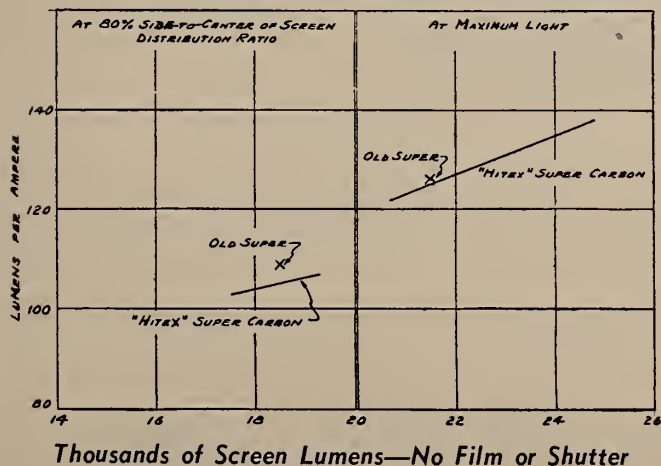
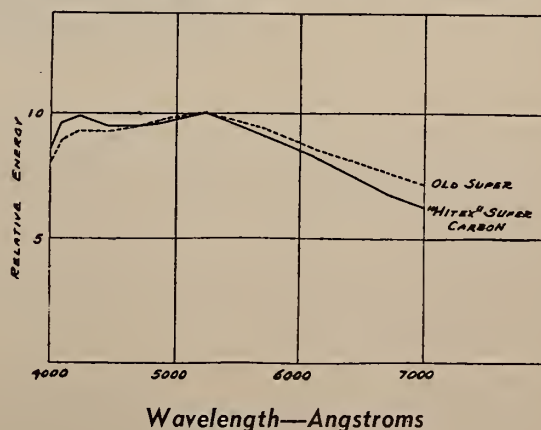


FIG. 4. Spectral energy distribution of light at center of projection screen at maximum light at 170 amperes—no film. Curves adjusted to approximate some visual intensity of illumination.



## Full Text of California Supreme Court Decision on Local Union Membership Acceptance, Rejection

SO intense and widespread was the interest generated by the publication herein last month\* of a summary of the decision of the Supreme Court of California regarding the "right" of an outside IA member to gain full membership in another IA Local Union, even after a period of temporary employment in the latter's jurisdiction, that IP has decided to publish the decision of the Court in full.

The case concerned IA Local 162 of San Francisco and two men from distant states who, on the basis of their IA membership in other IA locals, deposited their cards with Local 162 and sought and received employment in San Francisco theaters under the jurisdiction of Local 162. Subsequently, and admittedly without having even made application for membership in Local 162, these men instituted a court action to force Local 162 to admit them to full membership.

The first round of the contest in a lower court saw the decision go against Local 162 on the score of admission to member-

\* "High-Court Ruling on Local Rights," by Harry Sherman; IP for Nov., 1949, p. 5.

ship but not on the score of the actual and exemplary damages sought by the plaintiffs on the ground that they had been unjustly deprived of their rights to earn a livelihood.

### **Local Union's Membership Rights**

Upon appeal to the Supreme Court of the state, the decision of the lower court was sweepingly reversed in every particular. Most important is that portion of the court's judgment that jobs are vested in the *organization* (in this case Local 162) and not in an *individual*; and further that the IA Constitution specifically vests in its local unions the right to be the sole judge as to who shall be admitted to membership.

The successful outcome of this appeal was due in no small measure to the fine work done in the case by Michael G. Luddy, attorney on the West Coast for the IA General Office.

Although it is emphasized that in reversing the decision the Supreme Court remanded the case back to the lower court for reconsideration on an inclusive basis, it appears extremely doubtful that

the lower court would oppose the high court's finding and again approve full membership for the outside members.

The full text of the Supreme Court's decision, written by the chief justice and concurred in unanimously by the other six justices on the court, is appended hereto:

### IN THE SUPREME COURT OF THE STATE OF CALIFORNIA

Leslie Dotson and Walter J. Murrah, plaintiffs and appellants, vs. International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators of the United States and Canada; Local 162 thereof, *et al*, defendants and appellants. Filed Sept. 30, 1949.

Plaintiffs, Leslie Dotson and Walter J. Murrah, sought a writ of mandate compelling defendant Local 162, a labor organization, and certain of its officers to admit plaintiffs to membership as moving picture projectionists. They also asked an injunction to restrain defendants from preventing their employment in the area under the local's jurisdiction, general damages for alleged loss of wages, exemplary damages, and restitution of claimed overcharges in dues.

Defendants have appealed from portions of a judgment which granted a writ of man-

(Continued on page 31)

*Season's Greetings To Our Projectionist Friends Everywhere*

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also available for the positive carbon heat baffle. It is the only commercial arc lamp designed to operate with the new type 13.6mm carbons.

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If you want the brightest and most realistic projection for your screen . . . if you want to win greater patron favor for your indoor theatre or drive-in—better get all the information about the new Brenkert *Supertensity* Lamp from your RCA Independent Theatre Supply Dealer.

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*SPARKLE*



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"This screen  
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**T**HEATER Tv programs may be relayed by microwave radio relays, coaxial cables, or balanced telephone wires. The telephone company in certain areas is already equipped to furnish all three types of transmission facilities on a rental basis to certain Tv broadcast stations and networks. The services furnished include intercity transmission of programs by coaxial cable or by microwave relay, studio-transmitter links and remote pickups by cable, relay, or wire.

Other organizations also are equipped to furnish intercity microwave relay service in certain areas. The principal problems concerning the three methods of relay will be described briefly.

By May, 1949, the A. T. and T. coaxial cable provided the primary means of transmission of Tv programs from New York to Richmond on the East Coast (through the cities of Philadelphia, Bal-

EFFICIENT TV TRANSMISSION FACILITIES, THE FRUITLESS EFFORTS BY THEATER INTERESTS TO WIN APPROVAL THEREFOR FROM THE FCC, AND THE ISSUE OF 'PUBLIC NECESSITY AND CONVENIENCE' ARE DISCUSSED IN THIS SECOND OF A SERIES OF THREE ARTICLES ON DEVELOPMENTS IN THE FIELD OF THEATER TV.

Los Angeles. Telephone company officials have recently stated that a Tv channel from New York to Los Angeles could be made ready in about a year after the service is ordered.

### **Coaxial Cable Facilities**

The Bell System coaxial cable<sup>5</sup> is primarily used to multiplex telephone transmission. As many as 480 telephone conversations can be transmitted simultaneously on a single channel of each 8-channel cable without mutual interference. The relay and terminal equipment

If color Tv is desired by the theater interests, bandwidths of from 8 to 16 megacycles probably would be desirable, if not essential. At the present time, no extensive intracity coaxial-cable system is available, but some coaxial-cable links are in operation in New York and other cities.

### **Stiff Transmission Charges**

The current coaxial-cable Tv rates filed by the A. T. and T. contemplate charges which raise a serious economic question both for Tv broadcast stations and theater Tv. A single channel between two cities costs the user \$35 a month *per airline mile for eight consecutive hours each day*, and \$2 a month per mile for each additional consecutive hour. Thus, for 240 hours of service in one month, the rate would be \$35 per airline mile.

For occasional or part-time service, the rate is \$1 per airline mile for the first hour, and 25 cents per mile for each additional consecutive 15 minutes. Additional charges are made for the use of terminal equipment: \$500 per month is charged for a connection to the network for eight consecutive hours daily. This inter-connection charge for occasional service is \$200 per month, plus \$10 per hour of use.

To complete the service a Bell System sound channel must be used, at the regular rates applicable to the frequency-modulated service. If two users share time on the same channel, \$25 a month per airline mile is charged for four consecutive hours of daily service, with an interconnection charge of \$350 for each user.

### **Typical Theatre Tv Costs**

Returning to our typical theater Tv operation in Cities A and B, and assuming that City A on the coaxial cable is located 89 miles from the nearest network city, and that City B is located 35 miles from City A, the monthly charges for use of Bell System facilities for receiving programs would include<sup>6</sup>:

City A must pay a monthly charge of \$4,840 for use of 240 hours per month on an 8-hour per day basis, or \$3,640 for

# Theater Television: What, How and When \*

By JOHN EVANS McCOY and HARRY P. WARNER†

timore, and Washington); from Philadelphia to Chicago (through the cities of Pittsburgh, Cleveland, and Toledo); from Cleveland to Buffalo; and from Chicago to St. Louis.

By the same month, A. T. and T. also had in operation microwave radio relays for transmission of Tv programs from New York to Boston; Toledo to Detroit; and Chicago to Milwaukee. By the end of 1949, A. T. & T. will have completed network links (either coaxial cable or radio relay) from Boston to Providence; New York to Syracuse (through Schenectady and Utica); Buffalo to Rochester; Milwaukee to Madison; Philadelphia to Wilmington; and from Toledo south to Dayton, Cincinnati, and Columbus. Likewise, a radio relay between San Francisco and Los Angeles is planned.

At the present time, the Bell System does not contemplate extension of its Tv relay facilities across the continent in the near future. The means for a transcontinental Tv network, however, now exist, since the coaxial cable, equipped for long-distance telephone service, has been completed between St. Louis and

installed was originally designed for this purpose. However, it was recognized from the first that the bandwidth of each cable channel was sufficient to permit Tv transmission. New terminal equipment must be installed to convert the cable for Tv transmissions.

The equipment now used on the coaxial cable will permit transmission of a Tv band or 2.7 megacycles. This is not sufficient to carry the full requirements of the present 525-line, 4.5-megacycle standard Tv broadcasts, but recent developmental work will make possible wider-band transmission (up to 8 megacycles) when the demand arises.

While current theater Tv has adopted the 525-line standard used by broadcast stations, full utilization of the possibilities of theater Tv may require the use of higher definition and wider-band transmissions, which would raise a problem as to the suitability of the coaxial cable for intercity transmission of the theater programs.

\* Reprinted from Vol. IV, No. 2, of The Hollywood Quarterly with its kind permission.

† NOTE: The opinions and conclusions stated are the personal views of the authors.

120 hours per month on a 4-hour per day basis, *if the channel were shared* with another theater Tv group or a Tv broadcast station in City A. Likewise, if the theater group in City B utilized a Bell system microwave relay system to obtain programs from City A, it would pay a monthly charge of \$2,626 for use of 240 hours per month on an 8-hour per day basis, or \$1,966 for the shared use of the channel on a 4-hour basis.

Concern over the economic problems raised by the A. T. and T. coaxial cable rates led the Television Broadcasters Association to file a petition with the FCC requesting suspension of the rates, and a hearing upon the reasonableness of the rates and legality and other provisions of the tariffs filed. On April 28, 1948, the FCC ordered the hearing, but refused to suspend the rates. A determination on the reasonableness of the rates has been postponed indefinitely.

### Intercity Hookup Difficulty

Meanwhile, in the same proceeding (Docket 8963) the FCC has taken evidence and is considering one of the

issues which also is of concern to theater Tv. This issue involves the validity of the provision in the A. T. and T. tariff that a customer may not connect *intercity* channels of the telephone company with *intercity* channels of others except where the telephone company cannot make facilities available upon reasonable notice.<sup>7</sup>

If sustained by the FCC, this provision would effectively preclude the use of

<sup>7</sup> By A. T. and T. tariff filings made on January 14, 1949, effective March 1, 1949, this restriction on interconnection was relaxed somewhat. For example, if the customer orders service for a period longer than three months, in an area where the telephone company has no intercity channel facilities, the customer must give the telephone company 12 months' notice. But he will be informed within three months whether it will have facilities between the service points within a year. If such facilities will not be available, the customer may connect his facilities with those of the telephone company until three years from the service date, and he may continue to connect thereafter until the telephone company has facilities, subject to three months' notice from the telephone company. However, the FCC has suspended this tariff provision pending its consideration of the restriction on interconnection.

*intercity* radio-relay facilities built by the theater Tv groups, such as the radio relay contemplated in Fig. 1 between City A and City B. It would also limit the use that theater Tv might make of the radio-relay facilities offered on a common-carrier basis by Western Union.

The substantial capital costs required for construction of intercity coaxial-cable installations, together with other difficulties, appear to make it improbable that theater Tv will turn to the construction of its own intercity coaxial cable to provide a national theater service. According to A. T. and T.'s own figures, by the end of 1948 about 4,600 miles of intercity Tv channels had been put into operation at a cost of approximately \$20,000,000. These figures include the A. T. and T. intercity radio-relay circuits described hereafter.

### Microwave Radio Relays

The second method available today for intercity relay of Tv programs is afforded by microwave radio relays. Radio relays constructed by A. T. and T. extend the coaxial-cable system from New York to

## New 4-Inch Diameter, Long Focal Length Lenses

**L**ONG focal length lenses from 5 through 7 inches with a speed ranging down to F:1.9, designed especially for large movie theatres and drive-in situations, are now available from the leading designers of projection lenses. Up to this writing, official announcement of the availability of such lenses has been received from both Bausch & Lomb Optical Co. and Kollmorgen Optical Co.

While such lenses have been available for quite some time and in fact have been in use in the Hollywood studios for background process work, their widespread application has been prevented by the fact that 35-mm projectors could not accommodate the comparatively large diameter of 4 inches.

### Projector Manufacturers Ready

By January next all the leading projector manufacturers—Brenkert, Century, Motiograph, and Simplex—will be ready to accommodate these new long focal length lenses. Heretofore, it was necessary to return the projector head to the factory for a special machining job, at considerable expense, in order to adapt the head for such lenses.

In addition to having seen service in such studios as Paramount, 20 Century-Fox, Warner Brothers and Universal, these new lenses have been extensively field-tested in various theaters throughout the country which adapted their projector heads for this purpose.

The Bausch & Lomb series comprises eight new lenses in quarter-inch steps. The six lens elements are coated with an

anti-reflection film, with the achromatic combinations cemented together with heat-resisting, thermo-setting materials, and with the lenses hermetically sealed to prevent exposure to dust or vapors.

The construction of the Kollmorgen 4-inch diameter lens follows closely that of the standard Snaplite. Use is made of a one-piece, high-strength aluminum alloy mount, with no threaded joints to admit oil or moisture into the lens. This mount carries a gold anodized finish which is an

integral part of the metal and which consequently cannot chip, peel or flake off.

### Ordering Data Required

It is suggested that any situation contemplating the use of these new long focal length lenses acquaint the manufacturer with full details of their operation, including make and model of projector, screen size, length of throw, etc.

Appended is a table, reproduced through the courtesy of Motiograph, Inc., which gives specific data for large-screen drive-in theatres.

Projection Throw for Lens—E.F. (To Closest Foot)

Picture Width, Feet	5¼	5½	5¾	6	6¼	6½	6¾	7
20	127	133	139	145	151	158	164	170
25	159	167	174	182	190	197	205	212
30	191	200	209	218	227	236	245	255
35	223	233	244	255	265	276	286	297
40	254	267	279	291	303	315	327	340
45	287	300	314	327	341	355	368	382
50	318	334	349	364	379	394	409	424
55	350	367	384	400	417	434	450	466
60	382	400	418	436	455	473	491	509
65	414	434	453	473	493	512	532	551

Courtesy, Motiograph, Inc.

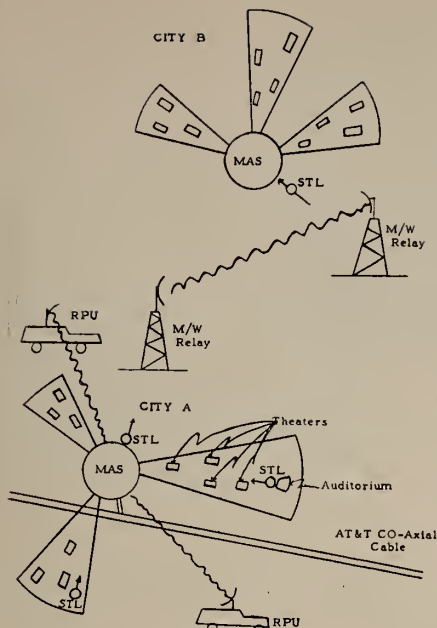


FIGURE 1

Typical two-city television relay system.

Boston, from Toledo to Detroit, and from Chicago to Milwaukee. A. T. and T. has a radio relay under construction between New York and Chicago, and has applied for FCC consent to construct other radio relays between San Francisco and Los Angeles.

In addition, Western Union has a radio-relay system available for use between New York and Philadelphia, and contemplates an extension of its system to the Midwest and South. These radio relays are operated on a "common-carrier" basis and are open to use by Tv broadcasters under tariff schedules filed with the FCC.

A. T. and T. rates are the same as those in effect for coaxial-cable inter-city service. The Western Union rates are somewhat different. Other privately-owned-and-operated radio relays are in operation in various localities.

A. T. and T. intercity radio relays operate on the frequency band 3700 to 4200 megacycles, and the Western Union relays operate on 5925 to 6425 megacycles. Both these bands are allocated by the FCC to "Common-Carrier Fixed Circuits." The A. T. and T. relays can provide a bandwidth of 4 megacycles; while the Western Union New York-to-Philadelphia relay is equipped to provide a 5-megacycle bandwidth.

### 'Balanced' Wire Transmission

Intercity Tv relays are based on line-of-sight transmissions from station to station, with intermediate stations separated by about 30 miles between cities. The problems involved in theater Tv use of intercity relays are substantially the same as the problems stated previously as to use of the coaxial cable.

The third available system for trans-

mission of Tv programs is the use of so-called "balanced" telephone wires. A network of such wires extends across the continent operated by the Bell System. Over moderate distances of from one to two miles, these telephone wires may be adapted to the purpose of Tv transmission. They thus are useful for intracity transmission, including remote pickup, STL, and possibly as the basis for a multiple-addressee system. The telephone wires may also prove to be the most economical method for distribution of theater Tv sound.

### Use of Radio Frequencies

As we have seen, radio frequencies may be expected to constitute an integral part of a theater Tv system under present conditions. Remote pickups of sports and news events are dependent upon microwave frequencies, since only by use of radio relay can theater Tv pickup units get the necessary mobility and flexibility.

Multiple-addressee systems for simultaneous distribution of programs to numerous theaters could use coaxial cables or even paired telephone wires; but there is no assurance that the telephone company will be in a position to furnish these services, or that the rates for the service would be within reach of potential theater Tv systems. It is also possible that theater Tv will consider the establishment of an intercity relay system using radio.

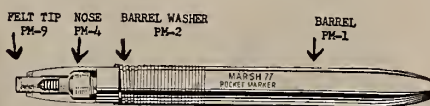
## A Novel All-Purpose Pocket Marker For Film Use

By ALEX WEISS

IA Local Union 160, Cleveland

Since multiple-reel pictures came into general use, the careful projectionist found it helpful to mark his films with proper titles, reel numbers, start marks, reel end, etc. For lack of anything better, the China or wax pencil was generally used for this purpose. However, due to its characteristic messiness and habit of smearing over the film, the projectionist's hands, and even over the projector parts, the wax pencil soon lost favor, although many projectionists are even now using it.

During the past several years paints of various kind, lacquers, and even nail polish have been used for marking films. While this method proved far better than the wax pencil, it left a lot to be desired and definitely pointed to the need for a simple, efficient and inexpensive marking device.



### FILM POCKET MARKER

Can't leak, sweat or flood. Patented valve action feeds ink to felt tip when pressed downward.

Under the Communications Act, the use of radio frequencies by theater Tv or by any other non-governmental service must be preceded first by the *allocation* by the FCC of a frequency band or bands for the use of theater Tv; second, by the *promulgation* by the FCC of rules and regulations governing the assignment and use of the allocated frequencies by individuals or organizations within the service; and third, by the *assignment* by the FCC of the frequencies within the general band allocated to theater Tv licensees upon proper application.

### First Hurdle Not Surmounted

Theater Tv has never jumped the first hurdle. It has never obtained an allocation of frequencies by the FCC for other than experimental use.

At the present time, no frequencies are even available under the FCC allocation table and rules for experimentation by theater Tv, except the 475- to 890-megacycle band (ultrahigh-frequency), which is earmarked for Tv broadcasting, and the frequency bands 16,000 to 18,000 megacycles and 26,000 to 30,000 megacycles, for which no equipment is available for the purpose of theater Tv relays.

The five theater Tv authorizations now in existence (four of which are held by Paramount and one by 20th Century-Fox) are solely experimental, special

(Continued on page 37)

Diligent search revealed a number of such markers in wide use by various industries. While the markers themselves were acceptable, the regular inks and colors as used by the other industries were not suitable for use on films.

### Special Ink Solves Problem

This problem has been overcome by the development of a *special ink* for use on film, making possible an ideal marker that is always ready for instant use. Films may be marked quickly and neatly. The marks dry very fast, will not buckle either nitrate or acetate film stock, and are permanent. The marker, shown here, will not smear, fade or peel during ordinary use. Yet, whenever necessary, the marks can be readily wiped off with a few drops of film cement.

The marker is made of solid aluminum in the shape of a conventional fountain pen with a felt tip and should last for many years. It holds 1/4 ounce of the special ink, enough for weeks of use before refilling. Ink is supplied in either red or bright yellow. The unit is fully guaranteed.

The user is strongly cautioned never to use paint, lacquer, or other inks except that furnished with the marker, as foreign compounds will prevent proper functioning of the unit. Address the writer at 2781 Hampshire Road, Cleveland 6, Ohio.

# IN THE SPOTLIGHT



By  
**HARRY  
SHERMAN**

**T**HIS department is actually a barometer of craft welfare, because it reflects not so much the views of an individual as it does the constant flow of helpful information which is received from those men of goodwill who, by informing and instructing others, are giving true expression to craft unity. This in itself is the highest form of brotherhood, the fundamental basis of a labor union.

We can only express our thanks in cold type; but at this Holiday Season we set down these few words of heartfelt thanks to all those whose unselfish devotion to the principles of Unionism and brotherhood have made it possible for us to be the medium of contact between a group of men who, however separated by distance, are bound together in a common unity—in our case, the International Alliance. Labor union, yes; but something more—and that something is the fraternity of men who have voluntarily joined together in the full knowledge that only in this way can they serve themselves and their fellowmen.

- Wage negotiations for Los Angeles Local 150 were successfully concluded recently and contracts with the major theater groups were signed calling for 10c per hour wage increase, two weeks' paid vacations and other benefits. The new contracts are retroactive to June 30 last. Carl Cooper, IA vice-president, in charge of negotiations, was ably assisted by Earl Hamilton, Charlie Vencill, Magnus Nielsen, and Rodney Bacon, of Local 150.

The Local officials are now in the midst of negotiations with the independent theaters.

- Jake Pries, business representative of Local 225, Atlanta, Ga., for many years, resigned from office recently and plans to devote more time to his personal interests. Jake has been employed as projectionist at the Fox Theater for the past 20 years.

- Mayor Gordon G. Dunn, of Fresno, Calif., appointed J. G. Viele, of Fresno Local 599, a member of the Police Advisory Commission. Viele was one of the founders of the Union Post No. 687, American Legion.

- The Legion Cinema Post No. 561 (Los Angeles) awarded Roy M. Brewer, president of the AF of L Hollywood Film Council and IA West Coast representative, with an American Legion citation

for his work against un-American activities.

- Herbert Aller, secretary and business representative of Cameramen's Local 659, Hollywood, was elected president of the newly organized AF of L Voters League Club in the 15th Congressional District of California. Serving as vice-presidents in the various Assembly Districts of the League Club are a number of IA men, namely: Roy M. Brewer, International representative; Roy Hostetter and James Tante, Local 728; Ted Ellsworth, Local 705; Robert F. Joseph, Local 776, and Emmett H. Zilles, Local 44.

- Upon completion of a successful year of operation, the Chicago Motion Picture Operators Beneficial Association, which provides sick, disability, retirement, death benefits, and vacations for the members of Local 110, invested part of its surplus

funds in the purchase of \$100,000 worth of U. S. Government bonds.

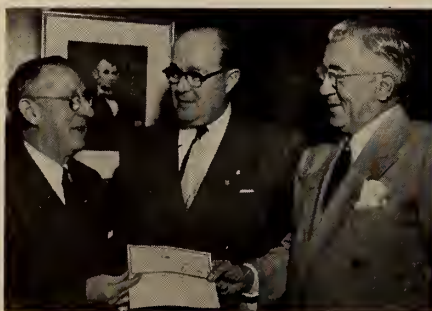
Shown here at the moment of purchase are, left to right, George Moore, Labor Representative, U. S. Treasury Dept.; Clarence Jalas, secretary-treasurer, and Gene Atkinson, business manager, of Local 110.

- In a recent column by Sidney Skolsky, the widely syndicated columnist, he deplored the lack of experienced cameramen in television studios. Mr. Skolsky evidently is not privy to what goes on "behind the scenes," for then he would have known that more than a year ago Herb Aller, business representative of Cameramen's Local 659, offered the services of his members (many of whom earn as high as \$1500 a week), to the tele studios at nominal salaries. His offer was rejected with the flimsy excuse that a "knowledge of electronics was preferred to that of expert camera operation and composition." We don't know what the *real* reason was for the rejection of Aller's generous offer, but we do know that present-day tele camera work leaves room for a great deal of improvement.

- The 40th biennial IA Convention will be held at the Masonic Temple, Detroit, Mich., the week commencing August 14, 1950.

- Michael J. Nugent, recording-corresponding secretary for the past three years of Local 650, Westchester Co., N. Y., has been elected a councilman of the city of Yonkers, N. Y., for the 1950-51 term. Running on the Democratic ticket, Nugent received all-out Labor support, particularly by the IA Locals in Westchester. In addition, he was endorsed by the Liberal Party and by the AFL-CIO Non-Partisan League. So close was the election in this predominantly Republican community that the results were not made official until all the voting machines were re-tabulated.

Nugent represented the Westchester Federation of Labor at the 1949 New York State AF of L Convention, and is treasurer of the AFL-CIO Non-Partisan





Michael J. Nugent

League. He has been a projectionist at the RKO Theatre, Yonkers, for a number of years.

Nice going, Mike, not only because we are always glad to see one of our fellows make the grade, but also for the swell fight you waged against tough odds.

• Willis B. Clarke, 59, member of Local 599, Fresno, Calif., died several weeks ago after a six-months' illness. For the past 32 years he worked as a projectionist in various theaters in Fresno, and took an active part in the affairs of Local 599. Clarke served as president of the Local for ten years, and about two years ago he was awarded a life membership card. A well-known radio ham operator, he was

one of the founders of the R-9 Radio Club. He was also a member of the Fresno Radio Association.

• We regret to report the death of our good friend, William T. Madigan, member of Minneapolis Local 219 and former 7th IA vice-president. Bill was stricken with a fatal heart attack at his home. He was born in Duluth, Minn., 62 years ago and had made his home in Minneapolis for the last 38 years. Bill was one of the first to join Local 219 when its charter was granted in 1911, and he served several terms as business representative and on the executive board. He worked in the projection room of the State Theater for a number of years until illness confined him to his home for several weeks prior to his death.

Burial was at the Catholic Cemetery in Duluth, with the following members of Local 219 acting as honorary pallbearers: Jack Lewis, Wallace Yutzy, Sherman Parrish, R. A. Peterson, Earl Smith, Gerald Hoover, Wood Smith, Ray Gullickson, John Kloster, Frank Rogers, Charles Fehling and Ray Dailey. Harry B. French, president of the Minnesota Amusement Co., was also a pallbearer.

Bill is survived by his wife, Charlotte; a stepson, Allen W. Harris, member of the Local, and a stepdaughter, Florence Harris, member of Local F-31.

• Evidence of the progressive spirit of Local 236 is this reproduction of the organization's advertisement which appeared in a special movie edition pub-

**Congratulations  
And Best Wishes**  
To  
**ALL THE THEATRES**  
In  
**THE BIRMINGHAM DISTRICT**  
From  
**Moving Picture  
Machine  
Operators Union  
Local No. 236**  
For Your Next 16 MM. Show  
**Call 7-4570**  
For a Competent Operator

lished on November 2nd last by the *Birmingham (Alabama) Post*. Note the significant reference to competency in connection with 16-mm film showings.

• The 100th anniversary of the birth of the late Samuel Gompers, founder and first president of the AF of L, will be observed January 5 next with a dinner at the Hotel Statler, in Washington, D. C. AF of L officials are completing details for this centennial observance, which is expected to number President Truman and many other top government officials among those present. IA President Walsh is on the Formulating Committee.

• William P. Covert, 2nd IA vice-president and business representative of Toronto Local 173 is on the sick list. He has been granted a leave of absence from his official duties with full pay. We hope that this much-needed rest will put Bill back in tip-top shape and that he will be able to resume his activities very soon.

• Elmer Winegar, treasurer of Buffalo Local 233 for the past 12 years, acted as chairman of the vaudeville quiz show staged last month at the Memorial Auditorium by Ismailia Temple Shriners. Elmer is a Past Potentate of Ismailia Temple.

• The 25-30 Club of Greater New York held a dinner-dance at the Hotel New Yorker last month, which was conceded to be one of the most successful affairs ever given by the Club. Many out-of-town members and practically the entire local membership of the Club attended.

• Recent out-of-town visitors to IP offices: Sid C. Blande, business representative, Local 570, Michigan City, Ind.; from Local 329, Scranton, Penna., came John Corby, secretary; Edward Friedman, president; Percy Carr, business representative; Donald Ball, Clayton Leas, and Edward Pantle.

## Season's Greetings

### PROJECTIONISTS LOCAL NO. 173

### I. A. T. S. E.

TORONTO, ONT.

CANADA

★ ★ ★

### Best Wishes

★ ★ ★

INTERNATIONAL ALLIANCE OF  
**THEATRICAL STAGE EMPLOYEES and**  
**MOVING PICTURE MACHINE OPERATORS**  
of the  
**UNITED STATES and CANADA**  
**LOCAL UNION NO. 376**

SYRACUSE

NEW YORK

## French Propose 21-mm Film Width to Supplant 16-mm

**F**RENCH film technicians are vigorously advocating change in film size from 16-mm to 21-mm in width, according to an article in *La Cinématographie Française*. The larger size would have two perforated edges carrying double the number of perforations as compared to the present 16-mm size—that is, the film would be perforated to a pitch similar to that of double-run 8-mm film.

Support for the wider gauge film is based on the reasons set forth in the following excerpts from the aforementioned article:

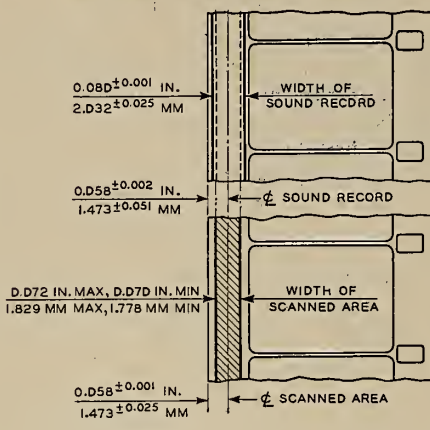
"Since the appearance of sound films, and especially since the adoption of 16-mm film as a sub-standard size, continual criticism has been encountered from the professionals. It was soon seen, in fact, that the practical advantages which were the reasons for its adoption were largely offset by technical limitations.

### Single Row of Perforations Decried

"All possible improvements have been added, but the major cause of its fragile nature still remains, since the 16-mm film carries only one row of perforations. Hence, there is an uneven pull and frictional contact with the sound track against the surfaces which are essential for its guidance through the apparatus.

"If one insists on keeping to the 16-mm size, then it is certainly impossible to add a

American Standard for 16-mm sound picture print (ASA Z22.41). Sound track shown is full-width, variable-density record.



second row of perforations, since the width of the picture (10.31-mm) and of the sound track (2.15-mm) cannot be reduced.

"Taking these data into account and after tests resulting from critical expert examination of worn copies, M. Jean Vivie, Chief of the Contrôle Technique du Cinéma, in 1944 put forward a studied plan, wherein the sub-standard film size should be altered to 19-mm to include a second row of perforations. This suggestion in no way modified the relative

arrangements of 16-mm dimensions, but it placed a second row of perforations alongside the sound track.

### Smoother Film Drive, Longer Life Seen

"By this means the film drive could be made symmetrical, and the sound track rested no longer on the edges of the guides. In consequence, a longer useful film life and better sound reproduction became possible."

Subsequent extended discussion and further experimentation by several leading French technicians resulted in a final decision in favor of the 21-mm width, since with this slight addition over the 19-mm minimum it became possible to extend the sound track somewhat so as to equal that on 35-mm film, while providing a larger margin between the track and the perforations.

### International Standards Aspect

It is emphasized in the article that while the plan involves a minimum of necessary alterations to various units or equipment, no definite steps have yet been taken in this direction inasmuch as the proposal for the new gauge has not yet been formally presented for ratification.

A proposal such as this is, of course, very definitely a matter for consideration by the International Organization for Standardization, in which France is represented by a very active group. As is well known, present French 16-mm stand-

*To You Craftsmen*

**MERRY CHRISTMAS!**

*For The New Year*

**CONTINUED PROSPERITY!**



**J.E. McAULEY MFG. CO.**

552-554 WEST ADAMS STREET  
CHICAGO 6, ILLINOIS

ards agree substantially with American standards.

There has been no meeting of the I.O.S. since the war, but it is likely that a session will be called for 1950, probably in Geneva, Switzerland. Incidentally, the SMPE acts as the Secretariat for Motion Pictures in the I.O.S. and undoubtedly would have more than a passing interest in the aforementioned French proposals for a change in standards. IP is, therefore, inviting the attention of the SMPE to this matter.

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## NEWS PROJECTIONS

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*Jottings of happenings which, while mostly of a non-technical nature, have a bearing upon general industry welfare and progress.*

**F**ORECASTING strong national newspaper pressure for the repeal of all wartime excise taxes was a recent lead editorial in the *New York World Telegram*, bellwether unit of the powerful Scripps-Howard chain, which charged that such taxes were seriously retarding business, particularly the motion picture industry. . . . United Artists has adopted a profit-sharing plan for district and branch managers and other sales personnel. Plan is based on a percentage of increase of 1950 sales over those of this year. . . . Word is that the FCC is about ready to hold a full-dress hearing on a national theater Tv set-up. . . . Tv sets are at the very top of the Xmas best-seller list, a nation-wide store survey shows. . . . Stiff distributor percentage terms for some of the "big" pictures are forcing upped admission prices in many situations.

Net earnings of 20th Century-Fox and subsidiaries for this year are estimated at \$8,200,000, a drop of about \$800,000 from last year. . . . Motiograph's new and elaborate brochure on drive-in theaters is available for the asking. Address 4431 West Lake St., Chicago. . . . More than 500 people were turned away from the Pilgrim Theater, Boston, when the Notre Dame-So. California football game was televised in large-screen fashion. . . . Motion picture salesman got a \$10 weekly pay hike under the terms of their new deal with distributors. . . . Loew's, Warners and 20 Century-Fox still tussling with the Dept. of Justice in an effort to avoid divorcement of production and theater chains. . . . U. S. Treasury reports \$3 million increase in admission tax take for October of this year over same month in 1948.

Republic Pictures has a robust back-

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## Greetings and Best Wishes

to all our friends

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## ESSANNAY ELECTRIC MFG. CO.

1438 NORTH CLARK STREET  
CHICAGO 10, ILLINOIS

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log of 21 feature films. . . . Columbia Pictures earned \$500,000 in third quarter of this year, as compared with a \$23,000 loss for similar period in 1948. . . . J. Arthur Rank, top British film producer, said to be brewing a deal to make 70 feature films available for American Tv stations. . . . Magnetic recording, utilizing a coating of metallic powder on the film base, is speeding Hollywood production and cutting costs sharply. . . . 58 of 81 towns in Penna. voted during the recent election in favor of Sunday movies.

DuMont had a profit of \$1,676,000 for the 40 weeks ending Oct 9. . . . Motion picture theater attendance nationally is estimated by the *Wall Street Journal* to have fallen off 10% from last year's mark. . . . 20 Century-Fox expects to increase its print order by 50 for its more important features. Theater men have been complaining bitterly about the print shortage and the physical condition of those prints available.

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### Some Observations on the Perception of Color\*

**W**HEN the eye is exposed for a long time to a scene illuminated, for example, by an ordinary incandescent light, the average color entering the eye is roughly equivalent to that of the light source itself, that is, as the eye looks first at one and then another of the objects the average quality of the light seen

Reprinted by permission from AN INTRODUCTION TO COLOR, by R. M. Evans; published by John Wiley & Sons, Inc. (N. Y. City).

tends to approach that of the incandescent light.

Since such a light is weakest in the blue end of the spectrum and next weaker in the green relative to the red, the eye tends to become quite sensitive to blue, somewhat less so to green, and least to red, and all stimuli are seen with the eye in this condition because the long exposure makes recovery slow.

### 'Color Constancy' of the Eye

This eye-sensitivity distribution, however, is opposite to the energy distribution of the source. Accordingly, a non-selective surface illuminated by this quality of light *tends to be seen* as white, i.e., it gives the same output to the brain from the receptors as daylight. Furthermore, all normal colors will tend toward their appearance in daylight because the eye tends to compensate for the deficiencies of the source by its own sensitivity readjustments.

This phenomenon is known among psychologists as "color constancy," because it tends to make the color of objects constant regardless of the energy distribution of the general illuminant in the scene. Obviously, it is of very great importance in daily life since it tends to make color a *property of the object* rather than the variable it would be if the receptor sensitivities were fixed. A white paper illuminated by artificial light would be very yellow indeed if the eye sensitivities did not readjust to the situation.—Chapter VIII, "The Visual Variables of Color."

### Quirks in Viewing Process

The average, normal, non-color conscious observer is motivated primarily by

a desire to observe the properties of objects. If the writer may be forgiven the remark, this applies also in a slightly different sense to artists and others who strive to "see" nature in one way or another.

Viewing of a color in a particular situation is, at best, a peculiar mixture of *attention, intention, and memory*. Depending on the particular background of the individual, one or the other of these will come to the fore, and with results that are well-nigh unpredictable without an introspective report from the individual concerned.

A naïve observer will report a leaf as green when the light reaching his eye *must* be pure blue—he hasn't *looked*. An artist will report that the distant view seen through green foliage is pink—he has *looked* for color, and his adaptation to the foliage has produced pink from the distant haze. The interested layman will report that the shadow side of the box is the same yellow as the illuminated side because he has looked for surface qualities. All are right and entitled to their judgments. Color is what you *do* see, not what you should see."—Chapter XI, "Color Perception."

#### **Accurate Color Representation**

Photography from the standpoint of the color expert \* \* \* is somewhat different from the commonly held view that



## *Fraternal Greetings*

**TREASURERS AND TICKET SELLERS**

**LOCAL UNION NO. 751**

**I. A. T. S. E.**

**NEW YORK, N. Y.**



it accurately and correctly reproduces anything placed before it. To do so it is necessary that the visual situation be analyzed clearly by the photographer and that such determinants of the final perception as will be missing in the final reproduction be supplied by *distortion*

### **A Glossary of Tv Terms**

Here is a list of terms which are becoming increasingly common in the field of television and more particularly in color Tv. Tentative definitions are suggested for some of the newer terms.

**Adaptability.** A feature of a proposed color Tv transmission system which makes its use possible with existing receivers to obtain monochrome—or color-pictures only.

of the colors and brightness of the scene itself.

The effects involved and the corrections that must be applied are often larger than the defects of reproduction in the better of the existing processes. —Chapter XIX, "Color in Photography."

**Adder.** An electronic device in which electrical signals are combined to form a composite signal. Example: combining samples of colors of the televised scene with the horizontal sync pulses.

**Additive Color.** A system which combines two colors to form a third.

**Compatibility.** Ability of color Tv transmission system to provide color service for modified or special color receivers and still produce monochrome pictures on existing receivers without modification.

A term used to designate electrically the average brightness of the scene being televised, as distinguished from the extreme highlights and shadows.

**Dichroic Mirror.** A glass surface treated with metallic salts which exhibits the property of reflecting only one color and absorbing all others.

**Dot Interlacing.** A method of placing dots of colors on a Tv screen to form the complete picture. During the first scanning of each color, the dots are separated by approximately their own width, and on the following scan of the same color, the dots are placed to fill the spaces in between.

**Electronic Commutator.** A switching arrangement composed of electron tubes and circuits used to connect circuits in rapid succession. At the color Tv transmitter, the commutator samples each of three colors in a specified order. At the receiver, the commutator routes the three color signals in proper order to three kinescopes.

**Field.** The partial image which results from a single scanning of green, red and blue lines from top to bottom of a picture.

**Line Interlacing.** The standard system of picture scanning in which odd-numbered lines are scanned as the first field and even-numbered lines being scanned as the second.

**Mixed-High Frequencies.** The portion of the Tv color signal which car-



## *Season's Greetings*

**NATIONAL CARBON COMPANY, INC.**

**30 EAST 42nd STREET**

**NEW YORK 17, N. Y.**





Dispenser developed by Fisher Mfg. Co., Rochester, makers of Ethylid film cement. Instead of the usual brush, a metal applicator having an interchangeable felt end is used to supply an even flow of cement. Unit is suitable for any cement which does not congeal upon exposure to air.

ries the finer (higher frequencies) details of the transmitted image.

**Picture Dot.** The basic—or picture element—area of each color pulse. In the RCA color system, there are 3,800,000 pulses for each of the three primary colors every second.

**Reflective Optics.** A system in which the rays of light are reflected as in the Schmidt system of projection.

**Refractive Optics.** An optical system in which the light focusing is performed by a lens through which the rays pass.

**Sampling Pulse Generator.** A circuit,

controlled by horizontal sync pulses, which in turn produces the timed pulses needed to actuate the electronic commutator.

**Sequential Systems.** A system in which the colors are transmitted one after the other and which depends on eye retention and picture tube storage to combine them. Is used for line, dot, and field sequential operation in which the respective elements are produced sequentially.

**Simultaneous Transmission.** A system in which the primary colors are transmitted at the same instant and are superimposed one over the other at the receiver.

**Subtractive Color.** A system which subtracts two colors from white light and leaves the required color.

**Time Multiplex.** Successive transmission of pulse samples of each of several signals.



## Greetings to the Craft

CENTURY PROJECTOR CORPORATION

NEW YORK, N. Y.

### How Social Security Works

What happens to the money you pay for old-age and survivors insurance? From each dollar of your wages (up to \$3,000 a year) 1½ cents (commencing January 1, 1950) is deducted for old-age and survivors insurance. Your employer matches your payment, penny for penny. This money goes to the old-age and survivors insurance trust fund.

Some of the money in the Trust Fund is used to pay current monthly benefits to retired workers and their families and to families of workers who died. More than \$50,000,000 in benefits is paid to about 2½ million persons every month. A small part (about 2% of receipts) pays the cost of operating the old age and survivors insurance program. The rest of the money is invested in Government bonds as a reserve to help pay for future benefits.

Remember: benefits are not paid automatically. A claim must be filed. Further information may be obtained from any local Social Security office.

### Kodak Earnings, Wage Dividend

Eastman Kodak's earnings for three quarters of 1949 were about 17% below earnings for the same period in 1948. Sales for the three quarters in 1949 were down about 2.4% from the same period last year.

Net earnings during the three quarters were \$35,130,264, or \$2.68 per common share. This compared with \$42,501,249, or \$3.41 a share, for the corresponding time in 1948. Sales were \$290,421,476, against \$297,546,670 in the 1948 period. Kodak has 55,000 shareholders.

The company's directors voted an employee wage dividend estimated at \$15,500,000, for about 48,000 employees in the Western Hemisphere. The wage dividend is the largest total amount in the 38-year history of the plan at Kodak, while the rate of payment is the highest since the present formula became effective.

## Season's Greetings

from

**M. P. M. O. LOCAL NO. 650**

**Westchester County, N. Y.**



## Greetings and Best Wishes

**PROJECTIONISTS LOCAL UNION NO. 407**

**SAN ANTONIO, TEXAS**



ive in 1928. Eligible employees will receive \$25 for each \$1000 earned at Kodak during 1945 through 1949.

#### Neumade Products' New Quarters

Neumade Products Corp. has opened new and more expansive quarters at 330 West 42nd St., New York City, 18. Located in a modern office building, it was possible to effect a consolidation of business, design and engineering departments, which are constantly developing new equipment for the motion picture, micro-recording and television fields.

Oscar Neu, president of Neumade (and also president of the Theater Equipment and Supply Manufacturers Assoc.) extends a cordial invitation to all film people to visit the new quarters.

#### Safety Film for Canadian Pics

A limited amount of the new Eastman safety stock has been made available for the first time by Canadian Kodak for the production there of 35-mm features and shorts, all such film in the past having been restricted for 16-mm use. A gradual increase in the quantity of this stock available for Canadian use is forecast.

#### R. H. Coffin New RCA Victor Ad Head

Ralston H. Coffin on December 1 assumed his new post as director of advertising for the Victor Division, Radio Corporation of America. During his 19 years association with many important national advertising accounts, Mr. Coffin was prominently identified with the mass distribution of consumer products. In his new post he will co-ordinate and administer RCA Victor's extensive advertising activities.

Greetings and Best Wishes for 1950

## PROJECTIONISTS LOCAL NO. 249

Dallas, Texas

### George Eastman—

#### *Father of Modern Photography*

*On the occasion of the opening of the George Eastman House, now the repository of the outstanding collection of photographic memorabilia in the world, Dr. C. E. K. Mees, Director of Research for Eastman Kodak Co., made the dedicatory address. Excerpts from this address constitute an important contribution to the history of the photographic art.*

IN 1877 George Eastman, 23 years old and employed as a bookkeeper in the Rochester Savings Bank, contemplated a visit to Santo Domingo. A friend suggested that he should learn to take photographs so that he could make a record of his trip. He didn't make the trip; but he bought the necessary apparatus and arranged with a local portrait photographer to teach him to make photographs.

Photographs at that time were made by what was known as the "wet collodion

process." Glass plates were coated with a layer of collodion made by dissolving nitrocellulose in a mixture of ether and alcohol containing some bromides and iodides.

The plate was made sensitive to light by dipping it into a bath of silver nitrate solution, and exposed in the camera while still wet, with a piece of blotting paper in the bottom of the holder to catch the solution as it drained off. Then it had to be developed at once while still wet.

#### *Tents Served as Darkrooms; Homemade Emulsions*

This made it necessary for the photographer to carry a tent around with him to act as a darkroom for preparing and developing the plate.

Eastman became interested in the accounts appearing in the British photographic papers of the making of gelatin emulsions. The *British Journal of Photography*, particularly, was publishing articles from enthusiastic amateur photographers who were making their own emulsions and coating plates which could be used dry instead of the wet plates. The use of gelatin for making photographic emulsions had been suggested by Maddox in 1833.

In 1878 the aforementioned *Journal* reported that Charles Bennett had exhibited a number of photographs, one of which was an instantaneous view of a boat on the river taken in approximately 1/20th second. Eastman said that it was the remarkable instantaneous photographs taken by Bennett, exhibited in London, which impressed him

(Continued on page 41)

Greetings and Best Wishes

for a

Happy Holiday

ALBERT F. RYDE

Business Representative

MOVING PICTURE PROJECTIONISTS

LOCAL No. 233, I. A. T. S. E.

Buffalo, N. Y.



## LETTERS TO THE EDITOR

To the Editor of IP:

We note in the Letters to the Editor column of your publication for November (p. 17) a communication relating to the Western Union Telcoarc.

The information given there is correct, except for one statement which we would like to have revised somewhat—that referring to the Telcoarc electrodes being “warranted by Western Union to operate continuously for 37 hours.”

Your readers will understand, of course, that the life of these electrodes are, like any other arc, dependent upon the wattage at which they are operated. A table published by us recently shows, for example, that when operated at 300 watts the Telcoarc electrodes have an approximate life of 30 hours; while if they are operated at 1000 watts, the approximate life is reduced sharply—sometimes by as much as four-fifths.

We congratulate you upon the very clear exposition of the principles of operation of the Telcoarc, and we know that you, no less than ourselves, would desire that the record be kept straight in terms of the foregoing statement.

W. D. BUCKINGHAM

The Western Union Telegraph Company

To the Editor of IP:

In the process of editing my article, “Fire

Extinguishers in Projection Rooms,” which appeared in your October issue, p. 12, you write into the story certain implications which did not appear in my original version. For example, I don’t recall having used the phrase referring to “dilatatory inspectors and exhibitors,” which I assume you added to the story in the process of suggesting a course of action by projectionists.

My point was a simple one: if these CO<sub>2</sub> bottle extinguishers constitute a hazard, then our people should waste no time in banishing them from projection rooms. The fact that Mr. Robert A. Mitchell, in commenting upon my article, didn’t see fit to go all the way down the road with me is o.k. with me. The rather extensive editing job done, however, and the insertion among my remarks of statements which I did not make, is quite something else again.

We seem to be in agreement on one point, and that is that the best way to handle a projection room fire is to get out of the room—hut fast.

GEORGE R. STEWART

IA Local Union 150, Los Angeles

Our apologies to Mr. Stewart. In suggesting a course of action for projectionists we were a bit on the over-zealous side. Sorry.—Ed.

## Klondike Gold Rush Days, Old-Time Movies Recalled

By OTTO NORDLING

Apprentice Member, IA Local 257, Ottawa, Canada

VISITING in New York recently, I was shown a reel of film that holds 6000 feet of film, and this reminded me that this much footage would be a complete show during my “silent” projectionist days in the Far North, the fabulous Yukon territory of Alaska, more years ago than I care to remember—the land of the famous Klondike gold rush, Klondike Kate, Klondike Mike Mahoney, Alex Pantages, and of the poet who immortalized that Territory, Robert Service.

The Dawson Family Theater in the Yukon was one of those unbelievable places where things happened that just couldn’t be—but were. Saturday night’s show was repeated on Monday night (50 and 75 cents admission), but the other nights of the week were scaled at 25 and 50 cents.

It should be understood, of course, that films could be shipped in only during the Summer months when the river was free of ice and therefore navigable. The Winter’s supply would be shipped in from September 10 to October 1; they

would be returned to the distributor in Vancouver the following June. By the time Spring rolled around the various pictures would have been shown over and over again.

### Keystone Cops, et al

Those were the exciting days of the Keystone Cops, Fatty Arbuckle, Harold Lloyd, Pearl White (the “Perils of Pauline”); Ruth Roland, Warner Oland, then a mere stripling; Mary Miles Minter, Rudolph Valentino, Francis Ford, Mary Pickford—why go on?—and the days, too, of such thrilling serials as “The Million-Dollar Mystery,” “The Diamond From the Sky,” “Hands Up!” and “Wolves of Kultur.”

Of course, if the temperature dropped to 45 degrees below zero, as it frequently did, the show would be cancelled and the admission money refunded. Wood retailed at \$18 a cord; power at 25 cents per kilowatt hour.

My duties were many and varied—stoking the furnace, shovelling snow, packing in the wood (so many cords of

it); taking cash at the door (no ticket office); changing the music rolls on the Wurlitzer electric piano, running the projector (there was only one), and various other odd chores.

The average show ran to 7 reels, and the audience was always kept informed of the progress of the entertainment by the conventional means of slides—“End of Part 1,” “Part 2,” “End of Part 2,” etc. The feature ran to about 5 reels, and there was a 1-reel comedy and a 1-reel news. I wonder if this wasn’t a better-balanced show than are today’s double-feature bills?

Come Spring the populace would be well informed about the happenings in the world—the same news had run so many times from October 1 to June 1. Of course we made out slides—and crude affairs they were: “Ladies Will Please Remove Their Hats”—and there were the inevitable ads for the local cafe, the butcher, the baker, and other emporia.

### Fresh Eggs—2 Months Old

Some idea of the primitive character of life in the Yukon in those days may be had from one of our ad slides which stated that “fresh eggs JUST ARRIVED on the last overland stage”—meaning that they had been en route from Vancouver for only two months! At 12 years of age I felt I was quite an important community figure.

During the Summer months—8 weeks of continuous daylight for 24 hours each day!—we were forced to cover tightly all the windows in our theater so as to keep out the daylight. Friday evenings was the big night for the kiddies, all admitted free, and Harold Lloyd was the top favorite. Capacity was 450, but the kids sometimes made it seem that we played to 1000 or more.

The Dawson Family Theater also served as the Athletic Association building. This building, since destroyed by fire, was the scene of practically all important social functions, political meetings and the like, and invariably the evening was topped off by a dance, even when the temperature hovered around

Reproduction of the author’s apprentice projectionist license for Ottawa, Canada.



50 below zero! The seats? They were merely picked up and stacked at the side of the hall.

The manager and owner of the theater, Fred H. Elliott, an Englishman who went to the Klondike during the gold rush days, is once again back in the mining business and still looks forward to striking a bonanza. The writer, after all these

years, is now serving his apprenticeship as a projectionist at the Imperial Theater in Ottawa, Canada. The Province of Ontario requires an apprenticeship period of 12 months.

Dawson City now has a modern theater which shows the very latest sound pictures, now that they have an air service twice weekly.

## The Origins of the 'Magic Lantern'<sup>†</sup>

The third and final instalment of an article which traces the development of the modern slide projector out of the old art of "mirror-writing," a derivation of the silhouette.

By J. VOSKUIL

Research Chemist, Geldermalsen, Holland

It is again Schott who tells us about this lecture in his "Magia Optica" (p. 426) and in spite of the fact that he does not mention the use of slides, Tacquet must have used them, as it is impossible to accept the fact that the pictures were painted on the mirror and wiped out again during the lecture (Fig. 3, *j*\*). Thus Tacquet must have introduced the first lantern slides.

All elements for a complete slide projector now were present, lacking only the mind to unite them into a whole. This mind proved to be the well-known Dutch scientist Huygens. He constructed a complete projector with a condenser and a *calculated projection objective*. Moreover, he had made separate slides (Fig. 3, *k*).

A new period in the development of the projection lantern now begins in which the names of Walgensten, Dechaes, Zahn, Hooke, and Molyneux must be mentioned. That the name of Huygens has receded into the background is the result of the fact that afterwards he felt somewhat ashamed of his activities connected with the projection lantern. Gradually the charlatans began to frighten the public with this instrument of wonder, quite apart from the drain on their purses. Huygens was above any form of charlatanry, and he tried to forget the "incident," as he called it, as soon as possible.

A final word about Kircher's "lanterna magica" in the second edition of the "Ars Magna": when this picture was viewed the projection lantern had already existed for ten years and therefore it is certainly incorrect to consider the device in Fig. 1\*\* as the first magic lantern and, concomitantly, Kircher as its inventor.

At the utmost, Kircher discovered the principle of optic projection when he, more or less by chance, used a lens to

improve the art of mirror-writing. In fact, he had not the slightest idea of the importance of his "invention" and was not able to develop it in a logical and systematic way.

When, for instance, he writes about the clearness with which the projected writing can be seen, he claims that, with the means at his disposal, a sharp image is obtained at a distance of 500 feet: "Thus, an instrument 24 times larger would give a sharp image at a distance 24 times greater, namely, 12,000 feet." Of course, there would be "some difficulties," and the images would be too large and too faint, but many improvements could be introduced, as for instance, by "using more concave mirrors."

In which way this had to be performed Kircher did not mention, "as time to make further experiments failed him." However, he "recommended his idea to other scientists for further reflections."

### Application First Consideration

When Huygens had finished his lantern in 1659, one of his acquaintances, a certain Guisony, wrote him a letter from Rome (1660) remarking that Kircher was not yet very familiar with the "invention of the lantern. . . . The good old Kircher (Kircher) is performing a great number of tricks with his magnet in the Collegium Romanum, but if he had the invention of the lantern, he should frighten the Cardinals with ghosts all the time."

According to this, it appears that Kircher's knowledge about "the art of light and shadow" had not made much progress in the years after he had experimented with Schott and de Sepi, and that the *application* of the magic lantern—namely, "frightening the Cardinals"—was nearer to his heart than its *construction*.

Indeed, if we have a critical look at Fig. 1,\* we notice that, for instance, the objective is in the wrong place, and apparently Kircher had Bettini's art in his mind, so we are justified in concluding that Huygens in 1659, Walgensten in 1660, and Dechaes in 1665, with their

"lanterns" were nearer the goal than Kircher in 1671. Kircher's complaint in the second edition of the "Ars Magna" that "Walgensten had sold copies of his lantern at high prices in France and Italy to many prominent people" is therefore unfounded.

PAINTING WITH LIGHT, by John Alton, A.S.C. 190 pages, 292 illustrations plus inserts in full color, 7½ x 10½ inches. The Macmillan Co., New York. \$6.

Light, when manipulated by skilled hands, can completely change the character of all things animate and inanimate, can create moods, can beautify or distort, can enrich or flatten a scene, and can impart to or steal from a pictorial composition the all-important element of dramatic impact.

In motion pictures, where no retouching is possible, lighting has been developed into a major art. Mr. Alton, a master of his craft, discusses fully both the technical and artistic aspects of lighting—just what lights are used and where placed, the special tricks of photography to obtain special effects, and the 1001 elements that enter into this art.

Every light, from senior solar spot to the inky-dinkie; every reflector for either indoor or outdoor work, the gobos, flags, cookies, diffusors, filters, screens and all the many gadgets used in professional lighting are clearly explained and shown in a prodigal use of illustrations. There are many useful facts on lenses, on cameras and their care, and on developing. The importance of color is stressed and explained.

Here is great value to the photographer, professional or amateur, and here too is much that is profitable to architects, decorators, artists, restaurateurs and all those who strive for the best in pictorial effect.



Greetings and  
Best Wishes  
for 1950 from

DETROIT PROJECTIONISTS'  
LOCAL NO. 199  
I. A. T. S. E.



<sup>†</sup> J. Soc. M. P. Eng., Dec., 1948.

\* IP for October, p. 21.

\*\* IP for August 1949, p. 19.

## FULL TEXT OF CALIF. HIGH COURT DECISION

(Continued from page 16)

date directing defendants to admit plaintiffs to full journeyman membership and an injunction restraining defendants from interfering with plaintiff's employment or refusing to dispatch them to employment with seniority and other rights equal to those of journeyman members.

Plaintiffs have appealed from portions of the judgment which denied them general and exemplary damages. The judgment also allowed plaintiffs certain sums as overcharges in dues, but these sums have been paid and are not included in the present appeals.

Local 162 is affiliated with the International Alliance of Theatrical Stage Employees and Moving Picture Operators of the United States and Canada, hereinafter called the International, which is chartered by the American Federation of Labor. The local has jurisdiction over projectionists employed in San Francisco and Marin Counties, and it has either written or oral contracts with at least 75 of the approximately 80 motion picture theatres in the area that they will employ only members of the local or persons dispatched by it as projectionists.

### Status of 'Outside' Members

Members of the locals are also members of the International, and, under its constitution, they may secure work in areas beyond the jurisdiction of their home locals by applying to the local situated where employment is desired, but they may remain members of their home locals instead of joining the local which dispatches them to work. Workers having this status were referred to at the trial as "outside members" or "visiting members" of Local 162.

Outside members have no right to vote or otherwise participate in the local's affairs, and they have limited rights to work. All positions within the jurisdiction of a local must be filled by its own members, but if the local membership is unable to care for all vacancies, preference must be given to members of affiliated sister locals, and persons not members of the International may not be given employment until all members of resident and out-of-town locals have been employed.

Under the International's constitution, each member must obtain from his home local a "working card," which appears to be in the nature of a membership card, and before accepting a position in the jurisdiction of another local he must deposit his working card with the secretary of the sister local who holds this card until the member leaves the jurisdiction. (Const. of Internat., Art. 21, Sec. 7, 8).

An outside member who wishes to join the local which dispatches him to work, instead of remaining in the status of an outside or visiting member, may proceed by

\* This transfer card relates only to the transfer of membership from one local to another, and it is not to be confused with the working card which is in the nature of a membership card issued by the home local and is necessary to secure work either within or without the jurisdiction of the home local. (Const. of Internat., Art. 21, Sec. 7.)



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either of two distinct methods authorized by the International constitution:

### Membership Procedure

(1) by "application for membership . . . upon the official printed form of this Alliance, to be supplied to the applicant by the local union to which he seeks admission" (Const. of Internat. Art. 21, Sec. 2); or (2) by obtaining a "transfer card"\* from his home local and presenting this card to the local with which he desires to become affiliated (Const. of Internat. Art. 19, Sec. 18). Under either of these methods the applicant must obtain the approval of the local to which he applies.

For many years plaintiffs have been members of locals situated in other states, Dotson

being a member of an Arkansas local and Murrah of one in Oklahoma, and they remained members in good standing of their home locals at all times involved herein.

Murrah came to San Francisco in November, 1938, and Dotson arrived in February, 1939. They did not apply for membership or present transfer cards to Local 162 but, rather, deposited their working cards with the local, and they were assigned to work as outside members. They continued to pay dues to their respective home locals, remaining members thereof, and they were dispatched to work because as members of their home locals they were also members of the International.

Plaintiffs and other outside men consulted a law firm, which, on March 7, 1945, wrote

a letter to the president of the International stating that certain visiting members of Local 162, whose names were not disclosed, desired to become members of Local 162 but that the local refused to admit them. The letter further stated that the local engaged in other assertedly improper and discriminatory practices, that the outside members were considering the possibility of litigation, and that they wished the International's president to investigate the matter.

Copies of this letter and of a second similar one from the law firm were sent by the International to Local 162. Much resentment developed in the local, because its officers felt that the letters to the International should not have been sent without revealing the names of the complainants, that the charges should first have been presented to the local, and that the outside members should not have hired attorneys who, it was claimed, represented C.I.O. unions and Communists.

There is testimony, though denied, that at a union meeting, Billingsley, the local's business agent, stated that the men responsible for the letters had "consulted a phony 'Commy' lawyer" and that "as soon as they were sure who the men were that they would be on their way out of town."

### Voluntary Withdrawal of Card

Plaintiffs were accused of having caused the letters to be sent to the International; but they denied the fact. Murrah subsequently told Billingsley that he did not desire to remain at work while the question of who sent the letters was being investigated. After giving the required two weeks' notice for leaving work, he quit on July 13, 1945, and on July 15, he requested return of his working card or membership card, which was mailed to him the next day and was never redeposited with the local.

Dotson last worked in San Francisco as an out-of-town member on July 24, 1945. The working card which he had deposited with Local 162 expired on August 1, 1945, and when he received a new working card from his home local he kept it and did not deposit it with Local 162 but obtained work elsewhere.

On at least two occasions in August and October, 1945, plaintiffs asked Billingsley if there was any work for them; and Billingsley replied that there was none.

At the trial plaintiffs based their claims with respect to membership in Local 162 upon two somewhat inconsistent theories: first, that the local had actually accepted them as members by permitting them to work under its jurisdiction for a number of years but nevertheless wrongfully deprived them of the privileges and indicia of full membership; and second, that the local maintained closed-shop contracts with employers and at the same time arbitrarily refused to admit plaintiffs to membership or dispatch them to work.

### Lower Court's Findings

It was also asserted that defendants, actuated by malice, conspired to deprive plaintiffs of their employment as projectionists, entitling them to both general and exemplary damages.

The trial court found that plaintiffs had not become members of or transferred to

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Local 162 but had paid dues to and remained members of their out-of-state locals, and the evidence is ample to support this finding. The court found and concluded, however, that the local had closed-shop contracts with practically all of the theaterers in the area and that it had maintained an arbitrarily-closed union from 1919 until the time of trial; and the local was ordered to admit plaintiffs to full journeyman membership and was enjoined from interfering with their employment as projectionists.

It was further found that there was no conspiracy, fraud, malice, intimidation or coercion on the part of defendants to deprive plaintiffs of their livelihood or to deny them admission into the local, and that plaintiffs, in July, 1945, had picked up the membership cards which they had deposited with Local 162 and therefore were not available for work within the jurisdiction. Apparently upon the basis of these findings, the court denied plaintiffs' claim for general and exemplary damages.

### Basis of Defendants' Appeal

The principal question presented by defendants' appeal is whether plaintiffs have established a right to relief under the recent decisions of this court that a labor organization may not properly maintain both a closed shop and an arbitrarily closed or partially closed union (*James V. Marinship Corp.*, 25 Cal., 2nd, 721; *Williams v. Int. etc., of Boilermakers*, 27 Cal., 2nd, 586; *Thompson v. Moore Drydock Co.*, 27 Cal., 2nd, 595).

These decisions also hold that an employee who has been injured by a union's conduct in violation of this principle may obtain an injunction ordering the union, in the alternative, either to admit him to full membership upon reasonable terms and conditions applicable to all persons, or to refrain from preventing his employment upon the ground that he does not belong to the union.

In the present case plaintiffs have established that Local 162 maintains closed-shop agreements with practically all of the theaters within its jurisdiction and that it is impossible for moving picture machine operators to obtain work unless they are dispatched by the local. Further, it is clear that defendants cannot satisfy their duties under the *Marinship* case by offering to resume dispatching plaintiffs to work as outside men, because the record shows that giving plaintiffs work in this manner would not be equivalent to granting them full membership in Local 162.

### Basic Question at Issue

As visiting members, plaintiffs would have few of the privileges accorded to regular members: for instance, they would not be allowed to vote for officers or upon matters of union policy, and their seniority rights, if existing at all, would not be equal to those of members. Although they would be under the control of the local and would be required to pay the same percentage of their wages as is paid by regular members of the local, they would be kept in an inferior status analogous to that of the auxiliary membership considered in *James v. Marinship Corp.*, 25 Cal., 2nd, 721, and the Junior membership condemned in *Cameron v. International Alliance*, etc. (N.J. Eq.) 176 Atl. 692.

The basic question, therefore, insofar as defendants' appeal is concerned, is whether plaintiffs have been arbitrarily excluded from full journeyman membership in Local 162.

Whether or not a labor organization is arbitrarily closed to a particular worker depends, of course, upon the facts of each case, and it is plaintiffs' burden to prove that they are entitled to membership, that membership is closed to them, and that it is arbitrarily closed, since these matters are essential parts of their cause of action under the *Marinship* case.

### Not 'Compelled' to Admit

Defendants contend that plaintiffs have not met this burden, and that the trial court erred in granting the requested relief, because plaintiffs have not shown either that they are able and willing to comply with the requirements and regulations of the union or that the requirements are unreasonable.

As recognized in the *Marinship* case, a union is not compelled to admit all persons as a condition to maintaining closed-shop agreements, and it has the "right . . . to reject or expel persons who refuse to abide by any reasonable regulation or lawful policy adopted by the union." (*James v. Marinship Corp.*, 25 Cal., 2nd, 721, 736.)

For example, the court there in effect upheld the right of the union to impose initiation fees and dues. It has also been held that an assessment of union members for the purpose of opposing a proposed amendment to

## Season's Greetings

from

LOCAL NO. 373

Terre Haute

Indiana

## Holiday Greetings

LOCAL NO. 165

Hollywood

Calif.

the State Constitution is reasonable, and that a member's refusal to pay the assessment can properly result in suspension of his membership and, consequently, by virtue of collective bargaining contracts, loss of his right to perform radio services or produce radio (*De Mille v. American Fed. of Radio Artists*, 31 Cal., 2nd, 129). Clearly a union cannot be said to have acted arbitrarily in withholding membership from an applicant who does not meet all reasonable require-

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ments or qualifications prescribed by the union as conditions of membership.

### IA Constitutional Requirements

Here it appears that the constitution of the International authorizes only two methods by which a person may become a member of an affiliated local, that is, by "application for membership . . . upon the official printed form of this Alliance," or by obtaining a "transfer card" from the local of which he is a member and presenting this card to the local which he desires to join.

The application blank provided for in the By-Laws of the International contains a statement that the applicant authorizes the local to which he applies to be his exclusive agency for collective bargaining and that he agrees to abide by the rules of the local and the

International. The form also requires certain information, including a list of theaters, laboratories, and studios where the applicant has worked, apparently to assist an investigation and appraisal of his qualifications, and the making of an application obviously constitutes a part of the union's regular procedure in processing new members.

Murrah, however, testified that he had *not* presented an application for membership or a transfer card to Local 162; and there is no evidence that Dotson ever applied for membership by either method. To the contrary, plaintiffs admit in their briefs that *they did not apply*.

Further, the constitution of the International prescribes certain other qualifications, such as that the applicant must be a citizen of the United States or Canada, that he must

not be a member of "any organization having for its aim or purpose the overthrow, by force, of the Constitution and Government of the United States or the Government of the Dominion of Canada," and that he must be of good moral character and reputation (Const. of Internat., Art. 1, Sec. 3; Art. 21, Sec. 1). A member found to lack any of the qualifications is subject to expulsion (Const. of Internat., Art. 1, Sec. 3).

### Local Union Requirements

The constitution of Local 162 provides certain other prerequisites for membership, among which are payment of \$250 initiation fee (Const. of Local 162, Art. 2, Sec. 4), and presentation of a physician's certificate that the applicant is free of tuberculosis and is physically able to perform the duties required of him (Const. of Local 162, Art. 2, Sec. 2.).

Plaintiffs do not claim that any of the foregoing qualifications or requirements for membership is unreasonable or beyond the scope of legitimate activity of a labor union, and this question is not before us.

The trial court did not make findings as to plaintiffs' qualifications for membership except that they were competent and qualified moving picture machine operators and projectionists, and no attempt was made by plaintiffs to prove compliance or ability to comply with all the terms and conditions prescribed by the constitution, nor did they offer to comply.

Further, it is admitted that plaintiffs did not apply for membership, and they state that at trial they relied on the belief that an application was not necessary in order to bring them within the rule of *James v. Marins Corp.*, 25 Cal., 2nd, 721. This position is, of course, without merit, since the *Marins* case expressly recognized the right of a union to impose reasonable requirements as conditions of obtaining membership.

### Membership Application 'Idle Act'

Plaintiffs also say that they did not apply for membership because it would have been an idle act, and, although not expressly argued, they apparently rely upon this theory as an excuse for failure to meet other requirements of the union. In support of their contention they point to evidence which they assert establishes that any application would have been arbitrarily rejected.

The record shows that from 1924 to July, 1945, no outside men had been admitted to membership, although five were admitted in August, 1945, before the complaint was filed herein, and six were admitted after the complaint was filed but before trial.

There is also evidence of statements and conduct by the local's officers from which plaintiffs could reasonably have believed that no outside man would be admitted without the personal approval of Billingsley, the local's business agent, and that Billingsley would not approve plaintiffs as members because they were suspected of having instigated the writing of the letters to the president of the International containing the charges made against Local 162.

The evidence, although conflicting and not entirely satisfactory, is sufficient, when considered as a whole, to show that defendants in effect told plaintiffs that they could



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not become members of Local 162 and that it would be useless and an idle act for them to apply. The trial court made no specific finding upon this issue, but it did conclude that Local 162 had maintained an arbitrarily-closed union from 1919 until the time of trial, and this may be sufficient to permit implication of a finding that it would have been useless for plaintiffs to apply.

The question need not be determined here, however, because on the record before us an express finding to this effect would not, without more, be sufficient to entitle plaintiffs to a judgment for the reason that they did not attempt at the trial to prove *compliance with the terms and conditions prescribed by the union*, nor did they offer to comply.

### Compliance With Requirements

Even if we assume that it would have been an idle act for plaintiffs to apply for membership and to make an offer to comply with other requirements of the union *prior to commencement of the action*, it was nevertheless incumbent upon them *at trial* to establish compliance or offer to comply with all reasonable terms and conditions prescribed by the union.

In the absence of such a showing or offer, they were not entitled to compel specific performance of the duty imposed on the union by the doctrine of the *Marinship* case to admit them to membership or to refrain from interfering with their right to work.

Obviously, proof that it would have been an idle act for plaintiffs to make an application would not establish that they are *qualified as members* or that they are able and willing to meet the requirements for membership. Since a union is *not required* to accept as members persons who do not meet *reasonable conditions* imposed by it, the court could not properly grant the relief requested unless plaintiffs were able and willing to comply with all reasonable regulations.

The matter clearly is not one of mere formality, because if courts were to order admission of persons into a union without requiring compliance with reasonable conditions, it would in effect give such persons rights and privileges beyond those extended to regular members and might lead to disruption of the union (see *James v. Marinship Corp.*, 25 Cal. 2nd, 721, 736).

### Analogy in Law of Contracts

Closely analogous is a problem arising under the law of contracts, where it is the settled rule that although an unqualified

repudiation by the promisor may excuse tender or performance of conditions precedent in advance of suit, it does not excuse a party, when seeking specific performance, from pleading and proving at trial that he is ready, able, and willing to perform the contractual conditions (see *Buckmaster v. Bertram*, 186 Cal., 673, 678; *Ray Thomas, Inc., v. Cowan*, 99 Cal., app., 140, 146; *Cockrill v. Boas*, 213 Cal., 490, 492; 4 *Pomeroy, Equity Jurisprudence* (5th ed., 1941) 1051; 49 *Am. Jur.*, 184).

It follows that *proof* that plaintiffs' applications would have been *arbitrarily rejected* would not relieve them of the necessity of showing at the trial that the union's conditions for membership were unreasonable and contrary to public policy, or that plaintiffs had complied with the requirements or at least had made an offer to do so, coupled with proof of ability.

Plaintiffs, however, assert that under the constitution of the International they have an *absolute* right to be admitted as transfer members and that Local 162 has refused to accept any outside men by this method; and they have requested this court to receive additional evidence for the purpose of showing that the local has ignored the transfer card provision of the International's constitution.

### Local's Right of Rejection

There is no merit in this position. While the constitution of the International *compels* a local to issue *transfer cards* to its members, the constitution *does not compel a local to accept members by the transfer method*. Instead it recognizes the right of the local *to which the card is presented* to reject the applicant, and there is nothing therein which forbids the practice adopted by Local 162 of requiring outside men to meet some or all of the qualifications required of new members.

This, of course, does not mean that there is any right to reject outside men *arbitrarily*, since under the *Marinship* doctrine, as we have seen, a union must either accept all applicants for membership upon compliance with reasonable terms and conditions, or refrain from interfering with their right to work.

However, it does not appear that there is anything improper or contrary to public policy in the requirement of Local 162 that outside men file an application and submit to a re-examination of their qualifications as a condition for membership. The mere fact that an outside man may have *originally com-*



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plied with the requirements of the International at the time he joined his home local, does not mean that he still meets those qualifications, nor does it in any way indicate that he can and does meet other reasonable conditions imposed by Local 162.

In the absence of a showing that the constitution of the International precludes Local 162 from requiring an application from outside members and from imposing other requirements as conditions for membership or that such requirements are unreasonable, plaintiffs have not shown that they are entitled to the requested relief.

### Requirements Not Unreasonable

There is nothing in the additional evidence offered on appeal which tends to prove that plaintiffs have complied with the local's requirements for membership or that those

requirements are unreasonable. Plaintiffs merely offered to prove that, after the decision by the District Court of Appeal, Murrah and a third person presented transfer cards to Local 162, but were notified that their cards had been rejected without prejudice to their right to become members by the application method.

This evidence, if true, would not justify or require affirmance of the judgment. Plaintiffs, therefore, are not entitled to its admission on appeal, and the request is denied. The offer of defendants to present rebuttal evidence is also denied.

The judgment must be reversed for the reasons above stated, and it is unnecessary to discuss defendants' further ground for reversal that plaintiffs failed to exhaust their remedies, *within the machinery provided by the union*, by appealing to the

president of the International or to the general executive board or the convention of the International.

### Basis of Plaintiffs' Appeal

Plaintiffs claim that the court erred in denying them both general and exemplary damages, and they rely in part upon their testimony that they were forced to leave their work and in part upon the finding of the trial court that since July, 1945, defendants have not made work available to them and have not dispatched them to employment.

The refusal to allow damages may not be successfully attacked upon the theory that plaintiffs were forced to leave their work, because the evidence is clearly sufficient to support the specific finding of the trial court that "it is not true that a conspiracy existed or that fraud, malice, intimidation or coercion was practiced by or on the part of defendants . . . to deprive plaintiffs of their livelihood as motion picture operators or of their membership in the International union, or to deny them admission into Local 162."

Nor can the court's refusal to grant damages be attacked on the ground that plaintiffs were not dispatched to work as outside members, since the constitution of the International provides that *outside men must keep their working cards on deposit with the local*, and plaintiffs admit that they had picked up their working cards.

The provision requiring deposit of working cards, however, applies only to outside men, *not to regular members*. If plaintiffs were qualified for full membership in Local 162, but defendants nevertheless arbitrarily denied them admission and at the same time refused to permit them to work without belonging to the local, plaintiffs would be entitled to recover damages for wrongful interference with their right to work (see *James v. Marins Corp.*, 25 Cal., 2d, 721, 728-729; *Rest.*, Torts. Sec. 766, 810; 31 Am. Jur. 844 et seq.; 30 Am. Jur. 64; *Brotherhood of Locomotive Firemen*, etc., v. *Tunstall*, 163 F. 2nd, 289, 293; *Smetham v. Laundry Workers' Union*, 44 Cal. App. 2d, 131, 135).

### No Wrongful Work Interference


The trial court's findings show that plaintiffs' earnings were greatly reduced after they stopped working in the jurisdiction of Local 162. No findings were made, however, relating to plaintiffs' right to damages on the theory that the reduction in their earnings was caused by a *wrongful interference with their right to work*, and the denial of damages, at least in the absence of findings upon the matter, is inconsistent with the court's conclusion that plaintiffs were entitled to the status of full membership and should have been given that status retroactive to June 29, 1945.

Inasmuch as the portions of the judgment pertaining to plaintiffs' rights to full membership must be reversed, and since the right to damages depends, at least in part, upon the outcome of the membership issue, the entire matter should be remanded to the trial court so that all of the problems may be considered together.

All portions of the judgment appealed from are reversed.

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## THEATER TELEVISION: WHAT, HOW AND WHEN

(Continued from page 21)

temporary authorizations (STA's) issued for 90-day periods and terminable by the FCC without advance notice. These authorizations are for frequencies allocated either to the use of Tv broadcast stations (*not to theater Tv*, a distinct and separate service) or to various non-broadcast services. Theater Tv cannot expect to use these frequencies for a regular theater service.

The motion picture industry since 1944

has made sporadic efforts to obtain the allocation of relay frequencies to theater Tv. The first such bid, spearheaded by Paul J. Larsen on behalf of the SMPE, was made in the general allocation hearings held in the fall of 1944 and the spring of 1945, when the end of the war was in sight (FCC Docket 6651).

### Film Industry's Abortive Efforts

Mr. Larsen requested an allocation of 1500 megacycles in 20-megacycle-wide channels in the radio spectrum between 300 and 6300 megacycles for the "immediately necessary postwar theater Tv service." This recommendation was keyed to the situation in New York City where, Mr. Larsen stated, 25 independent producing and exhibiting agencies might compete in the theater Tv service.

For the initial period, however, he assumed that 15 of these agencies should be provided with frequencies, including for each of the 15 agencies one remote pickup channel, one studio-transmitter channel, one multiple-addressee channel, and one intercity relay channel. He took the position that coaxial cable and wire facilities were not sufficient for the multiple-addressee system, since channels 20 to 60 megacycles wide would be required and only 4 megacycles were available on the coaxial cable.

Mr. Larsen presented the argument that, in view of the relative size and importance of the motion picture industry (\$1,600,000,000 gross income compared to \$280,000,000 gross income for the broadcasting industry) theater Tv should be treated on a "parity of opportunity" with radio broadcasting. By this phrase he meant "an equality of opportunity to develop both arts" giving each "equal opportunity to experiment, to commercialize, to improve, and to expand to its proper and demonstrable limits."

In its final report of May 25, 1945, in the general allocation hearing, the FCC allocated certain frequency bands to theater Tv on a shared basis with other services for experimental use only, making no exclusive allocations.

The bands on which *experimental* theater Tv were permitted included the 480- to 920-megacycle band (on which experimentation with multiple-addressee systems was permitted) subject to the understanding "that the band will be used primarily for Tv broadcasting to the public, with higher frequencies being more properly utilized by theater Tv and relay operation."

In addition, the following bands, allocated to the Fixed and Mobile service, were made "available for theater Tv experimental use, including multiple-addressee purposes if the need for such use can be established": 1325 to 1375; 1750 to 2100; 2450 to 2700; 3900 to 4400; 5650 to 7050; 10,500 to 13,000; 16,000 to 18,000; and 26,000 to 30,000 megacycles.

The FCC's final report thus opened the door for theater Tv experimentation in a large portion of the radio spectrum. As a practical matter, however, even in 1949 equipment is available for radio relay only on the frequencies up to the 7000-megacycle band, and equipment is actively being developed in the 10,000- to 13,000-megacycle band. Development of equipment for use in the 16,000- and

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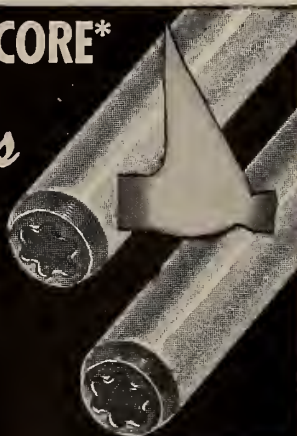
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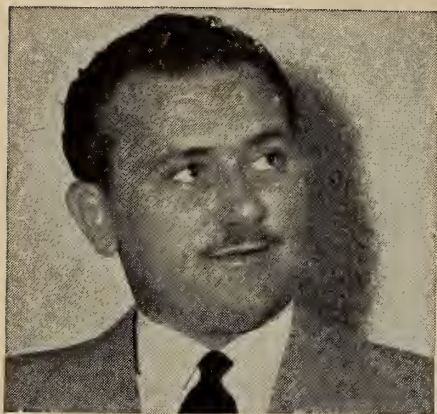
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The 1945 allocations in the spectrum



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between 1000 and 13,000 megacycles did not remain "final" for long. In November, 1945, the 4000- to 4200-megacycle band was allocated to Air Navigation Aids. In July, 1946, the FCC proposed an extensive reallocation of frequencies in the 1000- to 13,000-megacycle band. A hearing was held on this proposal, and Mr. Larsen again testified on behalf of theater Tv and the SMPE, on February 4, 1947.

### Sought 'Common-Carrier' Rating

He took the position that theater Tv should be classified by the FCC as a "common-carrier" service, entitled to use the frequencies allocated to "Common-Carrier Fixed Circuits." If this classification was not made, Mr. Larsen objected to the proposal by the FCC that Tv pickup and STL stations "will be licensed only to licensees of Tv broadcast stations and to common carriers."

Finally, Mr. Larsen objected to the failure of the FCC to include in its proposal frequencies for intercity Tv relay, which the FCC stated could not be accommodated in the 1000- to 13,000-megacycle band, since there was not sufficient spectrum space available. In addition, Mr. Larsen urged the FCC to classify

theater Tv as a separate non-broadcast service.

On the important question of whether theater Tv could use coaxial cable or wires for intercity or intracity transmission of programs, Mr. Larsen stated that at the present time theater Tv would not be able to use coaxial cable or wire facilities of the A. T. and T. because the 2.7-megacycle band provided was insufficient. He estimated that approximately 6- or 7-megacycle-wide bands would be required.

He conceded that eventually it would be more economical *in a city* to distribute programs by wire line, rather than by radio, and that eventually the common carriers would have wider-band coaxial cable and wire facilities. But he felt that for an indefinite period theater Tv would have to use radio for program distribution.<sup>8</sup>

### Fail to Convince FCC


The upshot of the 1947 allocation hearing was to make no allocation in the 1000- to 13,000-megacycle band for theater Tv, even on an experimental basis, and to indicate that the experimental authorizations in this band for operation on frequencies not allocated to the service might be "renewed on a strictly temporary basis for a period not to exceed one year from February 20, 1948."

These conclusions were contained in the FCC's report of February 20, 1948 (Docket 6651) which stated: "The requirements for theater Tv are still not sufficiently clear to indicate the need for a specific allocation for its exclusive use at this time. The Commission is of the opinion, from information now available to it, that a large part, if not all, of the functions required by theater Tv should be handled by stations authorized to operate on frequencies allocated to the use of communications common carriers<sup>9</sup>."

The FCC ruling, however, has not terminated theater Tv experimental use of radio frequencies. Since November 18, 1947, Paramount has held special temporary authorizations for theater Tv relay in the New York area (in the 2000- and 7000-megacycle bands) and it was granted two additional temporary author-

<sup>8</sup> Former FCC Commissioner E. K. Jett asked Mr. Larsen if any theater Tv was on the air. When Mr. Larsen answered that none was on the air, Commissioner Jett, pointing to the other demands for the frequencies in the 1000- to 13,000-megacycle band, stated: "Apparently, you would want all the other radio services to stop dead in their tracks and wait for the development of theater Tv service until they can go ahead."

<sup>9</sup> Apparently the frequency bands 16,000 to 18,000 and 26,000 to 30,000 megacycles still remain open for theater Tv experimentation, but the development of these frequencies is in the embryonic stage.



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izations on May 4, 1948, for use of the 7000-megacycle band in the New York area. Likewise, in September, 1948, 20th Century-Fox was granted an experimental STA for the theater Tv relay in New York in the 7000- and 12,000-megacycle bands.

### Theater Tv's Main Decisions

It is apparent from the foregoing discussion that theater Tv is at the cross-roads. It must determine its own future by deciding four main questions:

1. Will theater Tv rely on radio, coaxial cable, or wire for intercity and intracity distribution of programs?
2. If radio frequencies are to be used by theater Tv, does it desire the FCC to allocate frequencies for the use of theater Tv, or do the theaters expect to use the frequencies allocated to "Common-Carrier Fixed Circuits," relying on the existing common carriers to provide service?
3. If radio frequencies are needed, and theater Tv is not content to rely on the services of established common carriers, what steps should it take to obtain the use of such frequencies?
4. If theater Tv is to use common-carrier radio coaxial cable and wire lines, what steps should it take to obtain the use of such facilities?

### 'Public Convenience, Necessity'

If theater Tv groups decide to apply to the FCC for allocation of radio frequencies, or for authorization as a Tv common carrier, they must sustain the burden of convincing the FCC that a grant of their requests will serve the public interest, convenience, or necessity. In meeting this burden, theater Tv must establish to the satisfaction of the FCC:

1. That the service requires the use of radio frequencies, and that coaxial cable and wire lines will not provide a practical substitute.
2. That the frequencies requested are not more urgently needed by other radio services, particularly those necessary for the safety of life and property.
3. That there is a substantial public need for the service, and a strong likelihood that the service will be established on a practical working basis.

In prior appearances before the FCC, theater Tv has not met the burden of proof in these matters. It seems clear that another attempt to secure FCC authorization of the service and allocation of frequencies should be preceded by active steps by the motion picture industry to obtain quantitative data on the *public acceptance* of theater Tv, and to obtain definite commitments from qualified groups in as many areas as possible to the effect that they have positive plans to institute the service at an early date.

### Active Experimentation Essential

Data obtained by actual experimentation with a multiple-addressee theater Tv system would be advisable. A clear indication of how theater Tv would serve the public interest is essential. In the latter

connection, it is suggested that a multiple-addressee system, serving not only privately-owned theaters, but rendering service on a public-service basis to local, religious, educational, and governmental groups in the area, could present a strong showing of service to the public.

Tv broadcast stations are not available in sufficient numbers to make possible their ownership by any substantial number of religious, educational or civic groups. Theater Tv potentially is one means whereby such public service organizations may participate directly in the wonders of Tv.

On June 30, 1949, the FCC addressed letters to Paramount, 20th Century-Fox, and the SMPE, inviting statements to be submitted by September 2, 1949, concerning theater Tv. Without limiting the scope of the statements, the Commission requested expression of views covering six specific subjects:

1. What the minimum frequency requirements would be for a nation-wide, competitive theater Tv service;
2. What specific frequency bands you would propose to be allocated to a theater Tv service; reasons therefor;
3. The exact functions which would be performed in each such frequency band in a theater Tv service;
4. Whether and to what extent such functions could be performed, in whole or in part, by use of coaxial cable, wire, or other means of transmission not using radio frequencies;
5. Whether and to what extent existing

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- To make theater Tv economically fea-

sible it may be necessary for numbers of theaters in a city to join together in co-operative groups. Since these groups in all likelihood will find it necessary to qualify as licensees of radio facilities, and possibly as common carriers of Tv programs, it is important that these co-operative groups be owned and organized to comply with the licensing requirements of the Communications Act and the FCC.<sup>10</sup>

### Organizing Co-operative Groups

An example of a co-operative organization that is operating in the common-carrier field with FCC sanction is Press Wireless, Inc. This corporation was organized in 1929, with its stock held primarily by newspaper and news associations. It has been licensed or authorized by the FCC to engage in various forms of communications, including program transmission, radiophoto, facsimile, and message telegraphy. It conducts a public-press service on a multiple-addressee basis, transmitting news items and other material intended for publication by press agencies and newspapers.

Similarly, a theater Tv group might be organized to provide a limited common-carrier service to theaters, educational, and public-service organizations.

<sup>10</sup> Currently the FCC is studying the effect of the decision of the United States Supreme Court in *United States versus Paramount Pictures, Inc., et al.*, 334 U. S. 331, upon the qualifications of the major motion picture companies to hold broadcast and Tv licenses. In that case, Paramount, Twentieth Century-Fox, Warner Brothers, Loew's, Inc., and Radio-Keith-Orpheum were found to have violated the Federal antitrust statutes.

[NOTE: The third and final installment of this series will discuss the outlook for color Tv and will also consider the extremely involved problem and as yet practically neglected programming for theater Tv.—ED.]

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## GEORGE EASTMAN

(Continued from page 28)

with the possibilities of the dry-plate process.

Taking a formula from the *Journal*, Eastman started to make gelatin emulsions. He said that at first he wanted to make photography simpler merely for his own convenience; but soon he thought of the possibilities of commercial production. By June, 1879, he was not only making plates which were entirely successful, but he built an apparatus for coating them. This he patented both in the United States and in Europe.

### Kodak's Turbulent Beginnings

In April, 1880, Eastman started to manufacture dry plates. Difficulties were met and overcome; utter collapse was faced at least once; but within a few years plates were being manufactured on a commercially profitable basis, and Eastman was about to turn his attention to the development of new products. His experiments were directed to the use of a lighter and more flexible support than glass.

The first thing he tried was the use of paper to carry the emulsion, the paper being in the form of a roll carried in a roll holder which was used in the ordinary view cameras in the same way as the holders for glass plates.

The first film advertisements stated: "Shortly after January 1, 1885, the Eastman Dry Plate and Film Company will introduce a new sensitive film which it is believed will prove an economical and

convenient substitute for glass dry plates both for outdoor and studio work." This system of photography by roll holders fitted into the existing apparatus and was immediately successful, but the paper was not satisfactory as a carrier for the emulsion because the grain of the paper was likely to be reproduced in the print.

Eastman then tried to substitute a film of collodion for the paper, but he couldn't make a collodion film from the solution of nitrocellulose in ether and alcohol which was strong enough to carry the emulsion, so he coated the collodion on paper to get strength, then coated the emulsion on the collodion, and used this material after exposure and development by stripping from the paper the collodion and gelatin carrying the image.

### First Kodak in 1888

To reach the general public, Eastman decided to make a new kind of camera, which, introduced in June 1888, was the first Kodak. It was a box-type of camera, light and of small size, loaded with a roll of stripping paper of such length as to provide for 100 exposures. The price of the camera, loaded and including a shoulder strap and case, was \$25. After exposure, the camera had to be sent to Rochester, where the exposed strip was removed and developed and a new one inserted at a charge of \$10.

This was a radical change in policy. The roll holder had fitted into the existing system of photography. The Kodak created an entirely new market and made

photographers of people without any special knowledge of the subject, their only qualification being the desire to take pictures. Anybody could buy a Kodak, "press the button," and Mr. Eastman's company "would do the rest." Modern photography started with the Kodak.

While the Kodak was being developed, Eastman continued his attempts to get rid of the paper base. Solutions of nitrocellulose in various solvents eventually pro-

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duced a sheet of film base which had the necessary strength and flexibility.

In August 1889, the first transparent film in rolls was marketed. This film was first made by spreading a solution of nitrocellulose on a glass table 200 feet long by 42 inches wide (made up of 10 glass plates 20 feet long joined together at their ends) which when dried was first coated with a "substratum" of silicate of soda to make the emulsion adhere to it, and then coated with gelatin emulsion.

The advantages of this nitrocellulose film over the "stripping" film were that, as it was transparent and grainless, it could remain as the permanent support for the negative, thus avoiding the paper base and the stripping operation, also producing better results in printing.

In 1891 the amateur transparent film was further improved by making it daylight-loading. This was accomplished by winding it on a wooden core inside a light-tight box and attaching black cloth leaders to the ends of the film.

Later, it was wound inside a protective sheet of black paper with a sufficient overlength of the paper so that the camera could be loaded as it is today, without endangering the sensitive film.

In 1895 the first Pocket Kodak was designed. The first lot of these cameras manufactured amounted to 25,000; and in 1898 a further improvement in cameras was made in that they were made collapsible. The first of these was known as the "Folding Pocket Kodak." In 1900 the first Brownie camera, intended for children, was put on the market at the price of \$1.

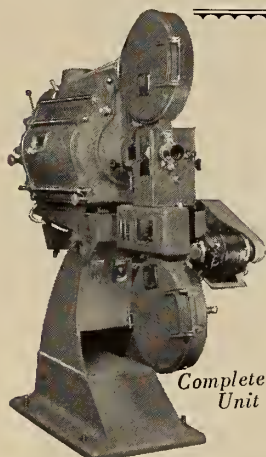
The development of roll film photography produced a situation very different from that which had existed previously. Until the coming of the Kodak and Brownie cameras, the photographer had been a more or less skilled craftsman: he developed his own negatives and made his own prints and was perforce interested in the technical aspects of the subject.

The new photographers using the simple roll film cameras no longer troubled in the least about the technique of photography nor were they interested in its craftsmanship: they were concerned only to get photographs of subjects which interested them. The manufacture of film developed as an industrial operation; while the finishing of the pictures was undertaken by thousands of small establishments all over the world who could collect the rolls of exposed film and develop and print them for the photographer.

In 1923, Kodak introduced 16-mm film, and the process of amateur cinematography associated with it. This introduction was exactly akin to the introduction of the Kodak. The film was supplied ready to be loaded in daylight in a convenient portable camera and after exposure was returned to Kodak, which developed the film by a reverse process to make a picture ready for projection in the home. Taking motion pictures in 1924 was no more difficult than taking pictures in the Kodak in 1889.

George Eastman, anxious to see a similar development in color photography, ordered work on many processes. The Kodakcolor process, introduced in 1928 for 16-mm pictures, came nearest to meeting his requirements; but when the problem was finally solved by the introduction of the Kodachrome process in 1935, George Eastman was no longer here to see it.

Photography owes its existence and progress to "amateurs." Fox Talbot, Scott Archer, R. L. Maddox, George Eastman—all became interested in the taking of pictures and in pursuit of their hobby worked out the improved processes and methods which are the milestones of photographic technique.

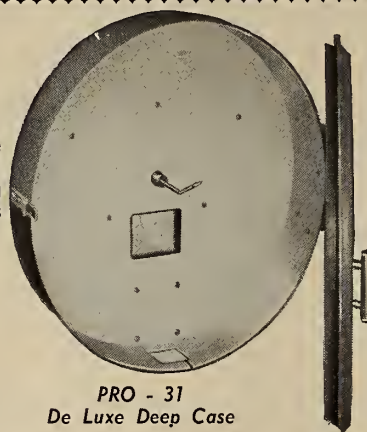


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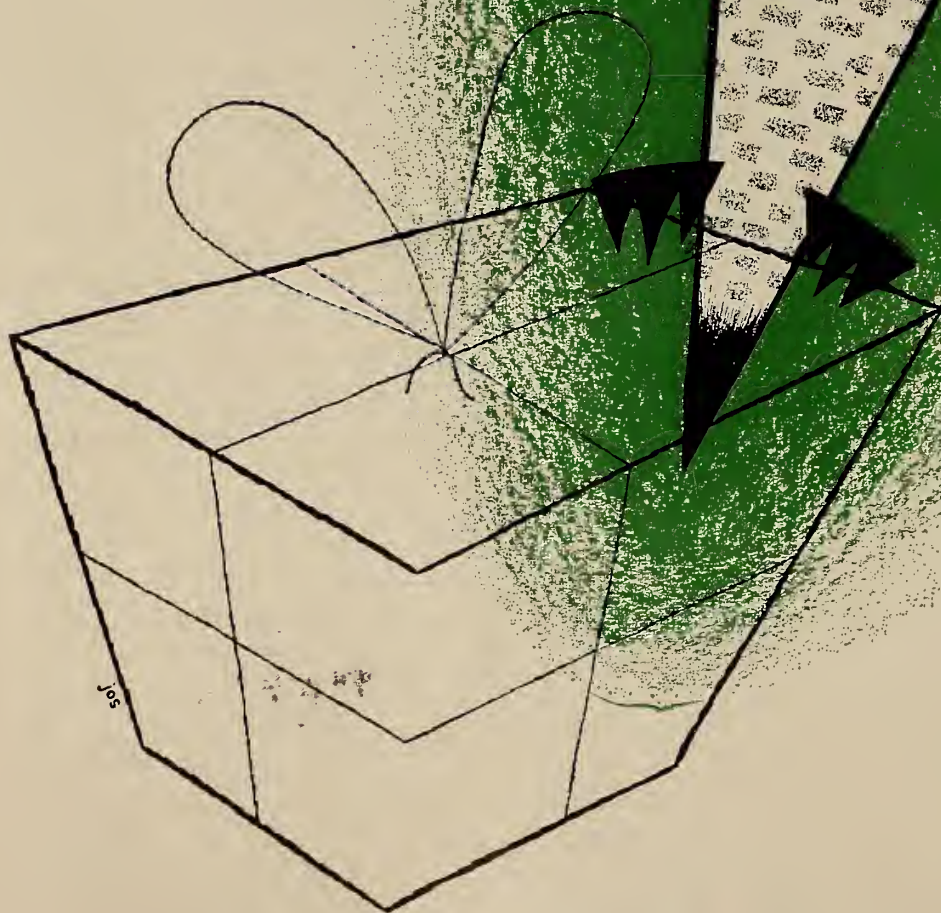
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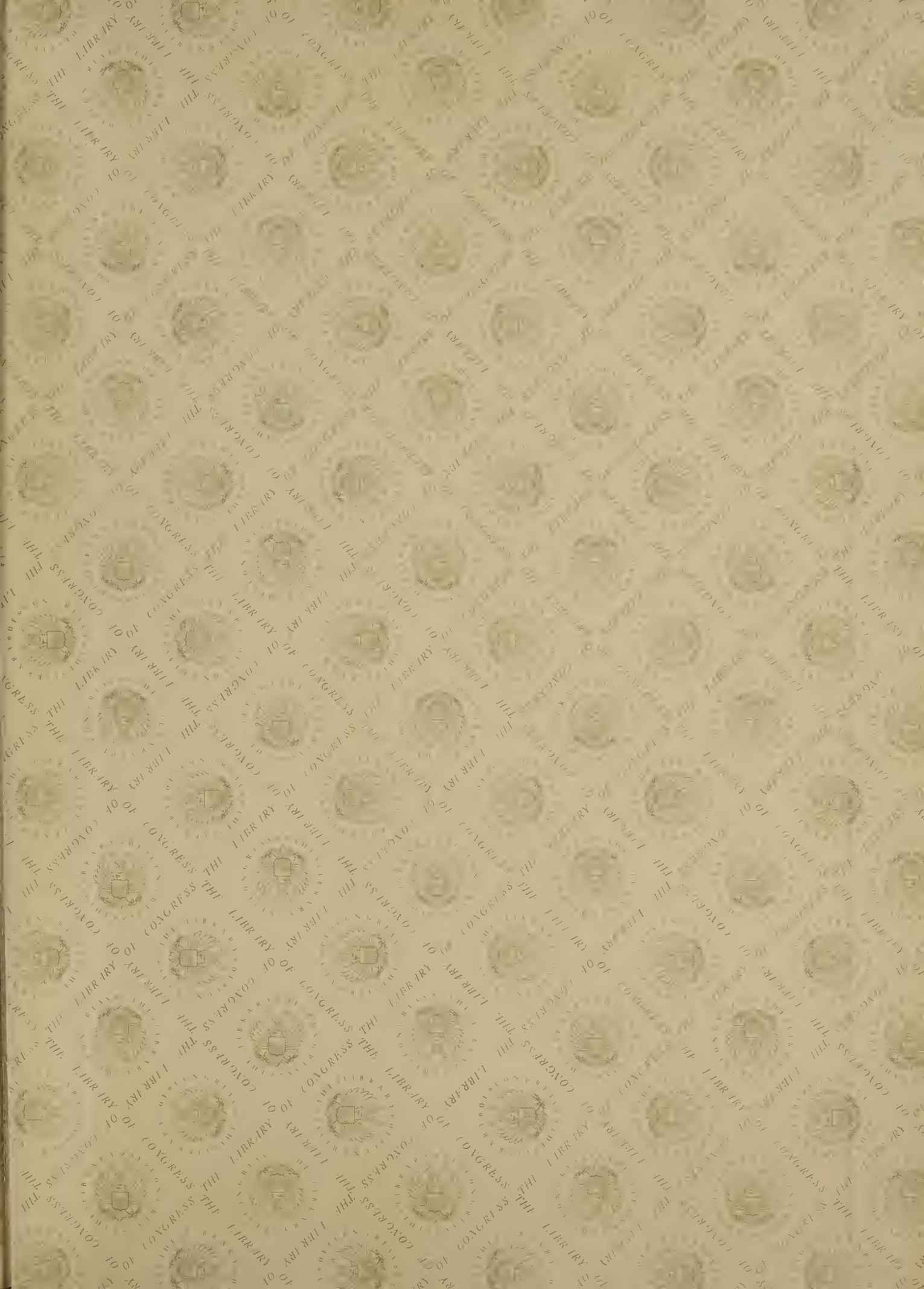
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